GALL-FORMING THRIPS AND ALLIED SPECIES (THYSANOPTERA : PHLAEOTHRIPINAE) FROM *ACACIA* TREES IN AUSTRALIA

BY

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Pp. 387–466 102 ***text-figures***

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CONTENTS

SYNOPSIS

Seventeen genera and fifty-five species of Phlaeothripinae associated with the leaves and phyllodes of Australian *Acacia* trees are figured and keyed. Six of these genera and eighteen of the species are here described as new, and many of the pre-existing nominal taxa are redescribed as they are not recognizable from their original descriptions. Also included are four new generic synonyms, fourteen new specific synonyms, and thirteen new combinations. The gall-forming habit is discussed and notes are given on the biology and morphological variation of most species. The phylogenetic relationships of this Australian group of genera are discussed, and the host-plant relationships are summarized in a table. The introduction includes short accounts of mounting methods and the morphological characters referred to in the keys.

INTRODUCTION

ACACIA and *Eucalyptus* are the two dominant plant genera of Australia. It is remarkable that although *Eucalyptus* is heavily attacked by insects there are no leaf-feeding Thysanoptera from any species of this genus, with the exception of the small polyphagous heliothripine *Australothrips bicolor*, although leaf-rolling Phlaeothripinae certainly occur on other Myrtaceae. On the other hand the genus *Acacia*, particularly the division Phyllodineae, supports numerous species of leaf-feeding Thysanoptera and a number of these have a gall-forming relationship with one or more host-species.

The phyllodinous *Acacia* species, in which the usual Leguminous bipinnate leaf is replaced by a flattened expansion of the petiole called a phyllode, are almost entirely limited to Australia. It is not surprising therefore that the genera of thrips which attack these plants are found also only in Australia. However the author is not aware of any leaf-feeding Phlaeothripinae from any other Australian genus of

Legume. Apparently the evolution of these thrips has not been along lines of botanical affinity, but has involved the filling of a series of ecological niches. This is probably inevitable in a low rainfall area, where the number of available host-species which are perennial and have reasonably broad leaves is rather limited. Leaf-feeding and leaf-rolling Phlaeothripinae are common on mesophytic plants of the high rainfall areas of Eastern Australia where they form a complex of species and genera, related to *Teuchothrips*, which extends into the Indonesian region. In order to colonize the drier parts of Australia, thrips have had to adapt to *Acacia* species on more than one occasion, and this has given rise to a series of groups restricted to *Acacia* trees. The Phlaeothripinae which have colonized other plants of the low rainfall areas such as *Casuarina*, *Geijera* and *Pittosporum* are not closely related to the *Acacia*-living species.

The insect order Thysanoptera is divided into two sub-orders, the Terebrantia in which the females have an ovipositor, and the Tubulifera in which there is no ovipositor and the last abdominal segment is produced into a tube. Many of the genera of Terebrantia in Australia can be recognized by use of Priesner's key to the genera of the world (1949), although only one small family, the Aeolothripidae, has been studied systematically (Mound, 1967). However the genera of the Tubulifera, in which only one family, the Phlaeothripidae, is recognised, are much more difficult. This is because so few species have been described that the available genera are poorly defined, and moreover there are far too few genera available for the numerous species that can be found. There are two sub-families in the Phlaeothripidae, the Megathripinae which have broad band-like maxillary stylets and feed on fungal spores, and the Phlaeothripinae which have slender stylets and feed on the tissues of higher plants, or on fungal hyphae, or rarely on other Arthropods (see Stannard, 1968). The Australia/New Guinea region is rich in Megathripine species but these are less readily collected than the numerous species of the Phlaeothripinae.

The present work is part of an attempt to provide a generic framework for the Australian Thysanoptera. The Phlaeothripine species living on *Acacia* trees have been treated separately because they are reasonably isolated systematically, probably on account of the ecological situation discussed above, and also because they are a major element in the thrips fauna over much of Australia. The genera discussed here fall mainly in the sub-tribe Kladothripina of the tribe Hoplothripini (Priesner, 1960), although the four species of *Empresmothrips* are of doubtful affinity. This sub-tribe is polyphyletic in the present author's opinion, and has been derived from leaf-feeding species of the Hoplothripina in the *Teuchothrips*/*Liothrips* complex of genera. Many of the species in this complex produce leaf-rolling galls e.g. *Tolmetothrips*, *Eugynothrips*, *Eothrips*, and in view of the morphological similarities it is reasonable to consider that the gall-forming Kladothripina have been derived from this stock. The author's views on the relationships of the various genera discussed in this paper are summarized in Text-figure 1 and referred to at length after each generic definition.

Gall-Formation. The process of gall-formation on *Acacia* trees has been discussed by Froggatt (1927) and more recently by the present author (Mound, 1970,*b*)

but little is known of the very early development of a gall. Apparently an enation develops rapidly on a phyllode in response to an adult feeding on the surface. The adult remains within the hollow enation and is then sealed into it as the lips of the gall meet overhead. Eggs are then freely deposited over the inner surface of the gall, although *K. rugosus* lays its first eggs close up to the lips of the gall on *A. pendula*. In several species the inter-segmental membranes of the abdomen become greatly distended in ovipositing females and such individuals are apparently able to lay more than one hundred eggs. Eventually, possibly as a result of two or more generations, a gall with an internal diameter of less than one centimetre may contain several hundred adult thrips. Several Lepidoptera and Diptera live as inquilines in these galls, and all four species of *Koptothrips* are apparently inquilines. *Csirothrips* and *Grypothrips* species probably only enter galls that have been attacked and the contents destroyed by lepidopterous caterpillars. A list of the *Acacia* species from which thrips galls have been reported is given in Mound (1970*b*), and a summary of the host records of Phlaeothripinae on *Acacia* trees is given below in Table II at the end of the descriptive text. Several Phlaeothripine species live in the mines of lepidopterous larvae in phyllodes, and both these and other species may be found breeding between pairs of tied phyllodes.

Morphological Variation. One of the most difficult problems in the present work has been the great range of variation shown by some species. The largest specimen of *Grypothrips mantis* for example is almost twice as long as the smallest, and this is accompanied by remarkable differences in body shape (Text-figs 18 & 19). Similar differences occur in *Katothrips tityrus* (Text-figs 23 & 24), whilst the differences between micropterous and macropterous *Oncothrips tepperi* are very confusing. On the other hand *Oncothrips rodwayi* is a relatively stable species although the postocular setae may be present or absent for no apparent reason. These difficulties are reflected in the number of synonyms listed here for any given species, the present author having had the benefit of studying relatively extensive collections which frequently included the different forms of a species from the same gall or collecting site.

Acknowledgements. Most of the material studied here was collected during a year's study leave from the British Museum (Natural History). Generous assistance was provided during this collecting tour by C.S.I.R.O. Division of Entomology, the Waite Institute, and the Queensland and Victoria Museums. Collections have also been made available by the Australian National Insect Collection (ANIC), CSIRO, Canberra; the California Academy of Sciences, San Francisco; the Queensland Museum, Brisbane; the Waite Agricultural Research Institute, Adelaide; the Naturhistoriska Riksmuseum, Stockholm; and Professor Dr H. Priesner of Linz, Austria. I am grateful to my assistant Mr B. R. Pitkin who drew most of the Text-figures, to Mr Arthur Smith who drew Text-figures 47–49 and 102, and also to Miss M. Steel who prepared most of the material for study and drew Text-figure 1.

Techniques. The material listed below under each species is mounted in balsam on microscope slides, although a number of specimens of the commoner gall-forming species remain in alchool. The author prefers to collect thrips into a low concentration of alcohol (50–60%), or into AGA (60% alcohol–10 parts; glycerine–1 part;

acetic acid–1 part), as these fluids cause most specimens to become distended and remain relaxed and soft. The AGA must be removed by washing for several hours in 60% alcohol, and black or very dark specimens may need to be bleached in cold 5% sodium hydroxide solution, although this damages the wings. Dehydration is best carried out through a progression of alcohols to absolute alcohol in the minimum effective time, and to facilitate this it is usually necessary to pierce the body in several places. Clove oil is a very convenient clearing agent before the specimens are placed in balsam as it tolerates small traces of water. Specimens mounted in one of the water-soluble mountants such as Berlese, Swanns or Hoyers are frequently inadequate for critical study. These media, particularly if preceded by caustic potash treatment, often cause antennal segments and the apices of some expanded setae to collapse. Water soluble mountants shrink to a greater extent than balsam as they dry and this often distorts the head shape due to pressure from the cover glass.

Terminology. Many of the characters used in the keys and descriptions below are based on recent work on the Thysanoptera, particularly L. J. Stannard (1957). The praepectus or praepectal plates are the anterior sclerites of the prosternum (not to be confused with the cervical sclerites), which are well developed in *Csirothrips* (Text-fig. 6) but are absent in *Akainothrips* (Text-fig. 2). The probasisternal plates are the posterior prosternal sclerites, which are greatly enlarged in some *Lichano-*

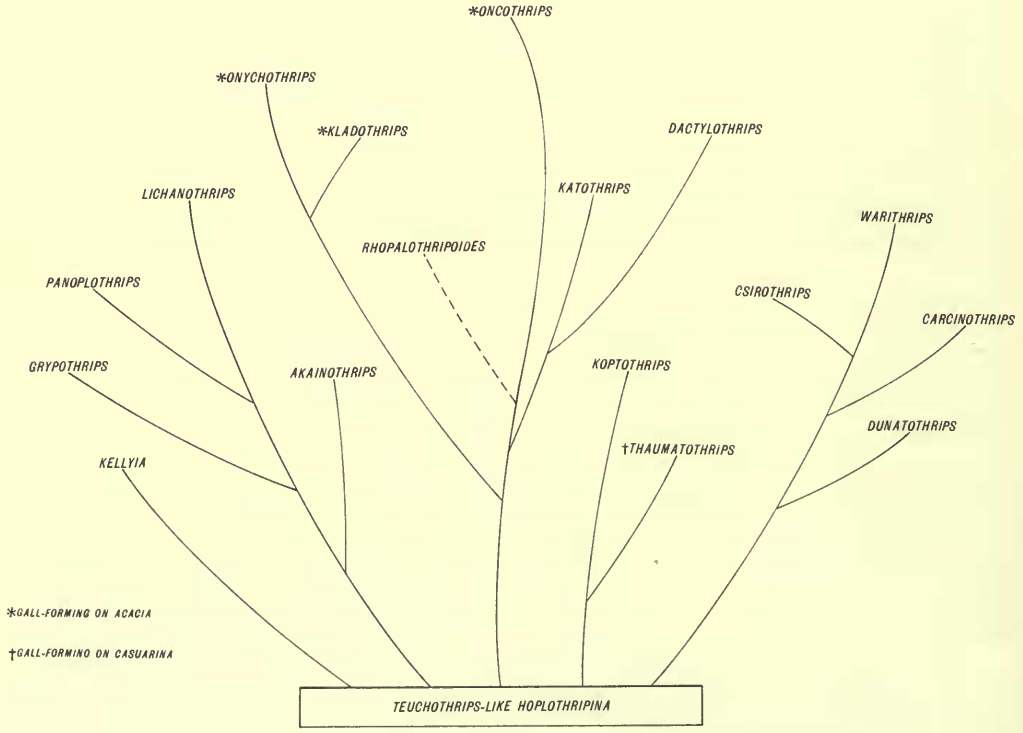


Fig. 1. Inter-relationships of some Australian Phlaeothripine genera.

thrips species (Text-fig. 65). The mesopraesternal plates are the anterior sclerites of the mesosternum, which are frequently reduced to two lateral triangles. Duplicated cilia of the fore wing occur in many genera on the distal posterior margin of the fore wing. The term 'pronotal shield' is used here to distinguish the dorsal sclerite of the pronotum, because 'pronotal width' is sometimes confused with the width across the fore coxae. The maxillary bridge is well known in the flower- and grass-living genus *Haplothrips*, it is a chitinous connection between the so-called maxillary guides which underlie the stylets and probably provide muscle attachments. It should be noted that in none of the genera treated here are the fore wings constricted medially as in the common flower-living Tubulifera of the genus *Haplothrips*, and in the gall-living species of *Euoplothrips* on *Smilax*.

Key to the Genera of Phlaeothripinae from *Acacia* Trees

1 Abdominal sternites with at least 6 pairs of marginal setae, in ♀ these setae form lateral combs longer than each sternite, in ♂ the setae are short and inconspicuous; dorsal pair of terminal setae on tube black and stout at base, twice as long as remaining terminal setae; antennals III & IV with three sense cones, V & VI ventrally with a group of about 10–20 short sense hairs (Text-figs 98–101); cheeks each with one stout seta in basal third.

Fore tarsi without a tooth; wings broad, duplicated cilia present (Text-fig. 102); large species in tied phyllodes on *A. harpophylla* . ***XANIOTHRIPS*** (p. 457)

– Abdominal sternites with no more than three pairs of marginal setae; apex of tube usually with three pairs of setae approximately equal to each other in length; antennals V & VI without a ventral group of specialized sensory hairs . . 2

2 Fore wings well developed, without duplicated cilia on distal hind margin.

Praepectus well developed (Text-figs 6, 95); head with several stout setae on the cheeks; cheeks projecting weakly behind eyes, narrowed to base but without constricted neck; maxillary stylets not deeply retracted into head; postocular setae never reduced; antennal III with one sense cone, IV with three sense cones . 3

– Fore wings absent or reduced; or fore wings present with several duplicated cilia on distal hind margin; or if fore wings present but without any duplicated cilia, then head without stout cheek setae 5

3 Fore femur massive, extending beyond head, inner apex produced into three large teeth; cheek setae about one third as long as head width (Text-fig. 7) ***CARCINOTHRIPS*** (p. 398)

– Fore femur not extending beyond head; cheek setae shorter 4

4 Fore femur without tubercles on inner margin; cheek setae stout, set on distinct tubercles; eyes bulging, half as long as cheeks (Text-fig. 6); glandular area of ♂ restricted to sternite VIII . . . . . ***CSIROTHRIPS*** (p. 398)

– Fore femur of female with a series of tubercles on inner margin; cheek setae weaker; eye length not half of cheek length (Text-figs 91–95); glandular area on sternite VIII of ♂ extends on to lateral quarters of tergite VIII . ***WARITHRIPS*** (p. 453)

5 Antennal IV with two sense cones, III with one sense cone 6

– Antennal IV with three or four sense cones, III with one or two sense cones . . 12

6 Fore femur with stout median spur.

Praepectus present; fore wing without duplicated cilia; head projecting in front of eyes, a distinct tooth posterior to eyes (Text-fig. 11); tube of ♀ shorter than tergite IX, tube of ♂ normal . . . . . ***DUNATOTHRIPS*** (p. 400)

– Fore femur without median spur or tubercle 7

7 Tergites with a pair of longitudinal sutures mesad of wing retaining-setae; wing-retaining setae often on large finger-like tubercles.
Head reticulate, anterior margin triangular, postocular setae not developed (Text-fig. 12); fore wing without duplicated cilia; praepectus present or absent; tube frequently not tubular . . . . . ***DACTYLOTHRIPS*** (p. 400)

– Tergites entire, without longitudinal sutures mesad of wing-retaining setae; wing-retaining setae in normal position 8

8 Pronotal shield longer than wide, replaced by a membranous area laterally (Text-fig. 43); tube less than 0·75 as long as head; forming galls on *A. doratoxylon*.
Kladothrips augonsaxxos (p. 422)

– Pronotal shield clearly wider than long, or, if as long as wide, then the tube is longer than the head 9

9 Fore tibia with a tubercle at inner apex.
Tarsal tooth larger in ♀ than in ♂; pronotal anteromarginal setae not developed; maxillary stylets close together in middle of head, retracted to postocular setae (Text-figs 80, 82); forming galls on *A. aneura* . . ***ONYCHOTHRIPS*** (p. 446)

– Fore tibia without an apical tubercle (rarely an extreme oedymerous ♂ of *Rhopalothripoides* has a small tibial tubercle but in that genus the pronotal anteromarginal setae are as large as the anteroangulars) 10

10 Apterous; pelta more than twice as wide as long; anteromarginal setae as large as anteroangulars; tarsal tooth of ♀ hardly developed, of ♂ well developed (Text-figs 84–88); in leaf-glands of bipinnate *Acacia* species ***RHOPALOTHRIPOIDES*** (p. 450)

– Macropterous to micropterous; pelta triangular; anteromarginal setae usually absent (present in *O. antennatus*); fore tarsal tooth of female large . . . 11

11 Tube beehived-shaped, constricted apically (Text-fig. 27); fore wing duplicated cilia absent, or wings reduced; sense cone on antennal III ventral (Text-fig. 35)
Katothrips hyrum (p. 414)

– Tube normal; fore wing with duplicated cilia, or wing reduced; sense cone on antennal III lateral; gall-forming species . . . ***ONCOTHRIPS*** (p. 439)

12 Fore wings without duplicated cilia, or wings not fully developed 13

– Macropterous, fore wings with duplicated cilia 14

13 Antennal III with two sense cones, IV with four sense cones; antennal VII not constricted at base (Text-figs 14 & 15); fore tibia without apical tubercle; maxillary stylets close together in middle of head (Text-fig. 13) ***EMPRESMOTHRIPS*** (p. 400)

– Antennal III with one ventral sense cone, IV with three sense cones; antennal VII usually constricted at base (Text-figs 33–37); fore tibia often with small apical tubercle; stylets not meeting in middle of head, maxillary bridge developed (Text-figs 23–25 & 30–32) . . . . . ***KATOTHRIPS*** (p. 409)

14 Pronotal shield slender, longer than wide, replaced by membranous area laterally (Text-figs 41 & 48); gall-forming species . . . ***KLADOTHRIPS*** (p. 420)

– Pronotal shield wider than long 15

15 Maxillary stylets wide apart, arranged in a V-shape, almost restricted to mouth cone.
Pronotal setae very reduced (Text-figs 65–67); navicula of male genitalia with an acute apex; large species with very broad wings, in tied phyllodes on *Acacia harpophylla*. . . . . ***LICHANOTHRIPS*** (p. 434)

– Maxillary stylets retracted into head, not V-shaped 16

16 Cheeks with at least one pair of stout setae in basal third.
Maxillary bridge well developed (Text-fig. 2); tarsal tooth absent in ♀, present in ♂ . . . . . ***AKAINOTHRIPS*** (p. 395)

– Cheeks without stout setae near base, but sometimes with several pairs of fine setae 17

17 Maxillary stylets close together in middle of head; praepectal plates absent . . 18

– Maxillary stylets wide apart, not approaching each other within head; praepectus present or indicated by a group of dark coalesced chitinous islets . . . 19

18 Maxillary stylets retracted to in front of hind margin of eyes (Text-fig. 10); antennal III about four times as long as wide; ♂ with glandular area on sternite VIII; inquilines in Hymenoptera galls . . . . . ***KELLYIA*** (p. 416)

– Maxillary stylets retracted to postocular setae (Text-figs 50–53); antennal III less than twice as long as wide; ♂ without sternal glandular areas; inquilines in thrips galls . . . . . ***KOPTOTHRIPS*** (p. 427)

19 Postocular setae not developed (Text-fig. 30); antennal III less than twice as long as wide, sense cone on ventral surface (Text-fig. 34) ***Katothrips duplex*** (p. 413)

– Postocular setae long; antennal III more than three times as long as wide, sense cone lateral; large black species with long head, in Lepidoptera leaf-mines (Text-figs 16–22) . . . . . ***GRYPOTHRIPS*** (p. 404)

AKAINOTHRIPS gen. n.

Type-species: *Adiaphorothrips citritarsus* Girault.

Brown macropterous species of Phlaeothripinae. Head longer than wide, eyes larger on dorsal than on ventral surface, cheeks with at least one pair of stout setae near the base; maxillary bridge well developed, stylets wide apart; mouth cone short and rounded; postocular setae sometimes not developed. Antennae eight-segmented, VIII not constricted at base; IV with three sense cones, III with one sense cone. Pronotum transverse, anteromarginal setae not developed; epimeral sutures complete; praepectus absent, mesopraesternum reduced to two triangular plates. Fore femur moderately swollen in ♀ and small ♂, greatly swollen in large ♂; fore tibia weakly drawn out at apex in large male; fore tarsal tooth absent in ♀, present in ♂. Mesonotal midlateral setae developed; metanotum reticulate medially, median setae small. Fore wings parallel-sided, duplicated cilia present. Pelta longer than wide; two pairs of sigmoid wing-retaining setae on tergites II–VII; sternites with transverse row of accessory setae; male without glandular area on VIII; tube shorter than head, terminal setae long and dark.

The presence of a maxillary bridge in the type-species of this new genus suggests a relationship with the Haplothripini, and an extreme gynaecoid male of *citritarsus* strongly recalls the genus *Haplothrips*. However praepectal plates are well developed in the *Haplothripini* and the fore wings are clearly constricted medially. Moreover *Haplothrips* and its relatives do not have stout cheek spines, and the apex of the male phallus is slender and well chitinized to form the pseudovirga. The apex of the phallus of *Akainothrips citritarsus* is soft and sack-like as in species of the Phlaeothripini and Hoplothripini. Stout cheek spines are commonly found in species of the Phlaeothripini, but *Akainothrips* has the maxillary stylets wide apart with a well developed bridge, antennal segment eight is not constricted at the base, and the cuticle is not strongly reticulate as in most members of that tribe. However, the maxillary bridge is variable in the genera of the sub-tribe Kladothripina of the tribe Hoplothripini, and although members of this tribe usually have smooth cheeks *Akainothrips* has more characters in common with the Hoplothripini than any other group of the Phlaeothripinae. *Teuchothrips simplicipennis* Hood, the type-species of Teuchothrips, has a weakly developed maxillary bridge but has a short head with no cheek setae. Other members of the *Teuchothrips* complex in Australia, including *Rhynchothrips annulosus* Priesner, are related to *Akainothrips* but require further study. The generic name is derived from a Greek word for a thorn, in reference to the cheeks.

Akainothrips citritarsus (Girault) **comb. n.**

(Text-figs 2, 3 & 8)

Adiaphorothrips citritarsus Girault, 1928 (40) : 2.

Girault described *citritarsus* from two specimens which originally formed part of the type-series of *Adiaphorothrips clavisetae* Girault, 1926. The description of *clavisetae* refers to a male and four females, and the description of *citritarsus* refers to 'two females with the male types of *clavisetae*'. The original slide bears five specimens but these represent four, not two, species. Two males and a female agree with the description of *clavisetae* in having a fore tibial tubercle. These are referred to here under *Grypothrips*, the males being *mantis* Karny although the female is a distinct species. One specimen, a female, agrees with the description of *citritarsus* in having long postocular setae, and this is here designated as the LECTOTYPE of that species. But the fifth specimen lacks postocular setae, has closely approximated stylets, and is probably related to *Rhynchothrips annulosus* Priesner.

The lectotype of *citritarsus* differs from the other specimens which have been studied, in having only a single pair of stout cheek setae. The species has been collected in company with *Grypothrips mantis* in lepidopterous leaf-mines and split stems on *Acacia* trees. Two specimens were also collected in tied leaves in company with the species of *Xaniothrips* and *Lichanothrips* described below. It is interesting to note that the sexes were collected in almost equal numbers, whereas females apparently predominate in many species of Phlaeothripinae.

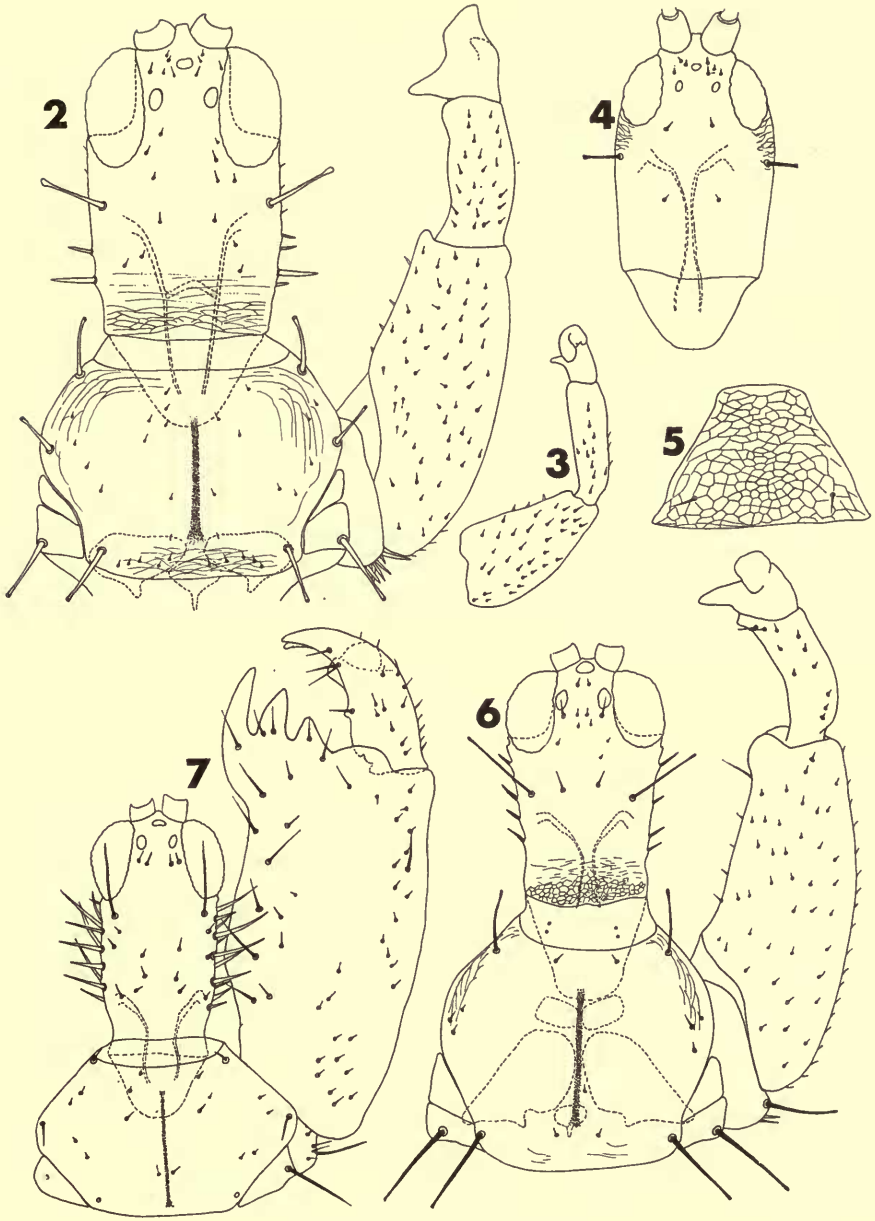
♂ macropterous. Colour brown; all tarsi yellow, also yellow on basal half of antennals III–VII, and base and apex of fore tibia; trochanters and base of mid and hind tibiae lighter than rest of legs (three specimens from Queensland have more extensive yellow markings on tibiae); fore wings pale, cilia dark; major setae, including cheek setae, pale; terminal setae of tube dark.

Head with transversely anastomosing lines of faint sculpture; postocular setae well developed (Text-fig. 2). Pronotum and fore legs differ in size considerably between oedymerous and gynaecoid individuals, fore femora with several short stout setae on inner margin. Sub-basal wing setae B_1 and B_2 stout with expanded apices, B_3 slender and acute. Apex of pelta varies from roundly acute to transverse; tergal posteroangular setae well developed, more than half as long as marginal B_1 on tergite III.

Measurements (in microns) of an oedymerous ♂ from Canberra with a small ♂ bearing same data in parentheses. Body length 2650 (1900). Head, length 336 (255); width behind eyes 215 (170); postocular seta 58 (32); longest cheek seta 40 (26). Pronotal shield, length 220 (135); median width 310 (225); epimeral seta 100 (55). Mesonotal midlateral seta 45. Metanotal median seta 35. Fore wing, length 1080 (800); distal width 90 (65); sub-basal setae 65, 70, 55 (30, 30, 40); number of duplicated wing cilia 13 (8). Tergite IX, B_1 155 (100); B_2 155 (97); B_3 145 (106). Tube, length 160 (130); terminal setae 320 (240). Antennal segments length, 26; 50; 71; 83; 80; 68; 58; 32 (26; 42; 55; 58; 58; 50; 47; 29).

♀ macropterous. Colour and structure similar to male, but although size range is great, females are never oedymerous, i.e. pronotum and fore legs of largest females are not greatly swollen. Fore tarsi without a tooth; tergite IX seta B_1 shorter than B_2. Postocular setae very short in specimens from Canberra and two females from Queensland, but well developed in the holotype and 10 ♀ from Walgett, N. S. W.

Measurements (in microns) of one female from Canberra. Body length 2500. Head, length 320; width behind eyes 210; postocular seta 16; longest cheek seta 32. Pronotal shield, length 155; median width 260; epimeral seta 75. Tergite IX, B_1 100; B_2 138; B_3 138. Tube, length 165; terminal setae 300.



FIGS 2–7. 2 & 3. *Akainothrips citritarsus*: 2, head, pronotum and fore leg of large male. 3, fore leg of small male. 4. Head of *Empresmothrips longfellowi*. 5 & 6. *Csirothrips watsoni*: 5, pelta. 6, head, pronotum and fore leg (praepectus and probasisternum dotted). 7. *Carcinothrips leai:* head, pronotum and fore leg.

MATERIAL STUDIED. LECTOTYPE ♀. QUEENSLAND: Dalby, in forest, 10.ii.1924 (*A. Girault*), in Queensland Museum.

AUSTRALIAN CAPITAL TERRITORY: Canberra, Black Mountain; 5 ♀, 6 ♂ on *Acacia longifolia*, 21.i.1964 (*E. M. Reed*), in ANIC; 4 ♀, 4 ♂ in leaf mine on *Acacia implexa*, 7.iv.1968 (*L. A. Mound* 624), in BMNH. NEW SOUTH WALES: 15 miles north east of Walgett, 10 ♀, 12 ♂ in stem-splits (? galls) on *Acacia stenophylla*, 5.vi.1968 (*L. A. Mound* 663), in BMNH. QUEENSLAND: 50 miles south west of Dalby, 1 ♀, 1 ♂ in tied phyllodes of *Acacia harpophylla*, 16.vii.1968 (*L. A. Mound* 734); 5 miles north of Goondiwindi, 1 ♀ on *Acacia ?harpophylla*, 16.vii.1968 (*L. A. Mound* 726), in BMNH.

CARCINOTHRIPS Moulton

Carcinothrips Moulton, 1929 : 264. Type-species: *C. leai* Moulton, by monotypy.

Moulton erected this genus for a single species based on a unique female. The only known genera to which *Carcinothrips* can be related are the new genera *Csirothrips* and *Warithrips* described below. These three genera are unusual in the Phlaeothripinae in having a very well defined praepectus but lacking duplicated cilia on the broad fore wings. This combination of characters is also found in *Dunatothrips* and some species of *Dactylothrips*. The present tribal classification (Priesner, 1960) does not readily accept these forms, although they are probably derived from the Hoplothripini.

Carcinothrips leai Moulton

(Text-fig. 7)

Carcinothrips leai Moulton, 1929 : 264–266.

Contrary to the original description, the fore tarsi are quite well developed, complete with a blunt tooth, but protrude ventrally into a lower focal plane on the unique holotype slide. There are three sense cones on antennal segment four, one sense cone on segment three, and the pore on segment two is close to the apex.

It is difficult to see how the grossly enlarged fore femora are moved, because the prothorax is relatively small. There are well developed muscles in each fore femur with a strong tendon entering the fore tibia, and so the front legs are most probably raptorial in function. However it is unlikely that the species is predatory as any prey held in the front legs would be well out of reach of the mouth parts.

MATERIAL STUDIED. Holotype ♀. SOUTH AUSTRALIA: Barton, [on *Acacia* sp. in September] (*A. M. Lea*), in California Academy of Sciences.

CSIROTHRIPS gen. n.

Type-species: *Csirothrips watsoni* sp. n.

Large dark macropterous species of Phlaeothripinae. Head longer than broad, narrowed to base; eyes large, cheeks with a small tooth behind eyes, eight or more pairs of stout cheek setae arising from small tuberculate bases; postocular setae well behind eyes; ocellar region weakly

elevated beyond base of antennae; maxillary stylets retracted as far as postocular setae, almost meeting in middle of head; mouth cone short and rounded, maxillary palps small. Antennae eight-segmented, III with 1 sense cone, IV with 3 sense cones; pore on II in apical half. Pronotum massive, epimeral sutures complete; anteromarginal and midlateral setae not developed, major setae not acute at apex; praepectus well defined; probasisternum large, mesopraesternum reduced to two lateral triangles; fore femora massive, fore tibia stout with small apical tubercle, fore tarsus with a stout tooth which is larger in ♀ than in ♂. Meso- and metanota reticulate; fore wings broad, cilia closely set, no duplicated cilia; sub-basal seta B_1 small, B_2 and B_3 well developed. Pelta reticulate, rectangular with anterior border shorter than posterior; tergites II–VII with two pairs of sigmoid wing-retaining setae; marginal setae on IX long; tube almost as long as head, constricted near apex, apical setae black and longer than tube. Sternites with irregular transverse row of at least 20 accessory setae; sternites III–VII laterally with paired areas of elongated reticulations possibly associated with glands in female. Male with large glandular area on sternite VIII; B_2 on IX short and stout.

This genus is discussed above under *Carcinothrips*. The majority of Phlaeothripine genera in which the praepectus is developed but the fore wings lack duplicated cilia include weakly sclerotized species inhabiting leaf-litter. In those forms however the fore wings are rather slender and the cilia widely spaced, not at all like the broad, closely ciliate wings of *Csirothrips*. The genera most closely related to this new genus are all Australian, *Carcinothrips*, *Warithrips* and *Dunatothrips*. *Dunatothrips* and *Dactylothrips* both have less heavily sclerotized though still broad wings, and in *Dactylothrips* the praepectus is weak and not always developed. The generic name is based on the initial letters of the Commonwealth Scientific and Industrial Research Organisation in recognition of the assistance they provided for this study.

Csirothrips watsoni sp. n.

(Text-figs 5, 6 & 9)

♀ macropterous. Colour dark brown to black, thorax paler particularly when immature; tarsi yellow, fore tibiae yellow along inner margin, mid and hind tibiae yellow at base; antennals III–VII yellow at base with increasing dark areas distally towards apex; wings pale, cilia dark; major setae shaded, terminal setae of tube black. With the morphological characters given in the generic definition above.

Measurements (in microns) of holotype, with small and large paratypes in parentheses. Body length 3800 (3400–5000). Head, length 500 (460–550); width across eyes 320 (300–340); basal width 240 (230–250); postocular seta 160, arising 90 posterior to hind margin of eye; maxillary palps 60. Pronotal shield, length 380 (320–600); median width 510 (470–670); anteroangular seta 80: epimeral seta 160. Median metanotal setae 90, distance apart 130. Fore wing, length 1600; maximum width 230; sub-basal setae 100. Hind tibiae 400 (360–470). Tergite IX, setae B_1 ?(260–350); B_2 260 (260–320); B_3 ?(270–310). Tube, length 390 (380–460); terminal setae 350. Antennal segments length, 50 (40–60); 73 (70–80); 97 (90–110); 80 (80–110); 87 (80–90); 80 (75–90); 65 (65–70); 32 (30–35); sense cone on III 220.

♂ macropterous. Colour a little darker than ♀. Fore legs slender, tarsal tooth not massive.

Measurements (in microns) of allotype. Body length 2700. Head, length 350. Pronotal shield, length 240; median width 420; epimeral seta 100. Tergite IX, B_1 240; B_2 115; B_3 225. Tube, length 290; terminal setae 320.

Material studied. Holotype ♀. Queensland: 25 miles SSW of Eulo, in small spherical gall on *Acacia aneura*, 17.x.1968 (*J. A. L. Watson*), in ANIC. The following immature instars were found in the gall with the holotype; I 3; II 11; III 1; IV 6; V 1.

Paratypes. QUEENSLAND: 25 miles SSW of Eulo, allotype ♂ and ♀ with the following immature instars II 9; III 2; IV 2; V 1, in small spherical gall with circular hole on *Acacia aneura*, 17.x.1968 (*J. A. L. Watson*).

NORTHERN TERRITORIES: 50 miles west of Alice Springs, 1 ♀ in spherical gall with circular hole on *Acacia aneura*, 22.x.1967 (*L. A. Mound* 283); Ayers Rock, 1 ♀ in spherical gall on *Acacia aneura*, 24.x.1967 (*L. A. Mound* 289), in BMNH. NEW SOUTH WALES: Sydney, 1 ♀ with 1 fifth instar (*W. W. Froggatt*), in NSW Department of Agriculture. SOUTH AUSTRALIA: Frome Downs Station, 10 miles south of Lake Frome, 1 ♀ with 1 first instar in gall on *Acacia aneura*, 2.iv.1938, in Waite Agricultural Research Institute.

The first and second instars of this species are readily distinguished from those of other gall-inhabiting species by the presence of black areas of chitin at the base of each major seta. This species is not a primary gall-producer, but invades and breeds in the galls of other thrips.

DACTYLOTHRIPS Bagnall

Dactylothrips Bagnall, 1923 : 629–630. Type-species: *D. australis*, by monotypy.
Hannibalia Girault, 1928 (43) : 2. Type-species: *H. priscus*, by monotypy.
Dactylothrips Bagnall; Mound, 1969 : 173–179.

This genus has been redefined and figured recently, with a key to five species. These species probably live on *Acacia* trees in the galls of other insects such as Hymenoptera. *Katothrips* is morphologically similar to *Dactylothrips* and the species apparently have similar cryptic habits. This group is undoubtedly larger than present records indicate, and study of dead galls on *Acacia* trees will yield further species. At present it is not possible to associate males with females of *Dactylothrips* species, and so no males are as yet described of the five known species; *australis* Bagnall (Text-fig. 12); *giraulti* Mound; *marsupium* Mound; *priscus* (Girault); *tasmani* Mound.

DUNATOTHRIPS Moulton

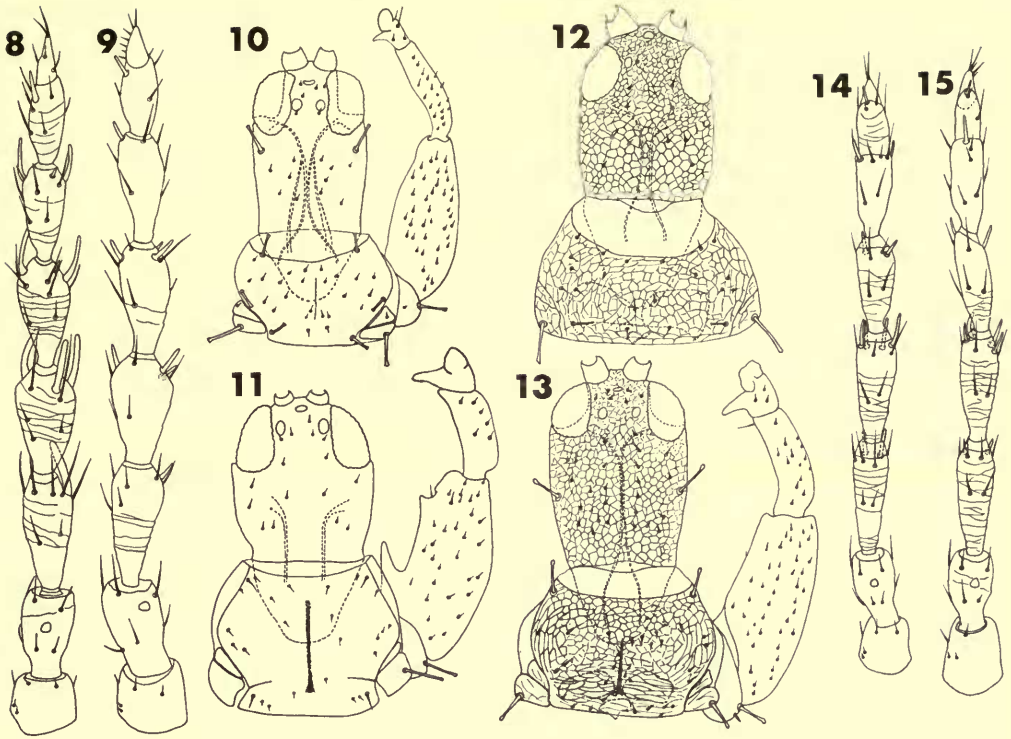
Dunatothrips Moulton, 1942 : 10. Type-species: *D. armatus*, by monotypy.
Dunatothrips Moulton; Mound, 1969 : 179–182.

This genus has been redefined and figured recently, with a second species from Central Australia, west and south of Alice Springs. *D. armatus* is known only from the holotype female (Text-fig. 11) taken at Barton, South Australia, but *aneurae* Mound was observed to have the unusual habit of living in a membranous envelope surrounding apical phyllodes of *Acacia aneura*.

EMPRESMOTHRIPS Karny

Empresmothrips Karny, 1920 : 40. Type-species: *E. combustipes*, by monotypy.
Coenothrips Bagnall, 1924 : 629. Type-species: *C. fallax*, by monotypy. **Syn. n.**
Eucoenothrips Bagnall, 1926 : 553 [*nomen novum* for *Coenothrips*].

Antennae eight-segmented, VI broadly truncate at apex, VII not narrowed at base, closely joined to VIII; III with 2 sense cones, IV with 4 sense cones. Eyes not large, postocular setae



FIGS 8–15. 8 & 9. Antenna: 8, *Akainothrips citritarsus*. 9, *Csirothrips watsoni*. 10–13. Head, pronotum and fore leg: 10, *Kellyia biadenes* female. 11, *Dunatothrips armatus*, female. 12, *Dactylothrips australis*, female. 13, *Empresmothrips fallax*, male. 14 & 15. Antenna: 14, *Empresmothrips fallax*. 15, *Empresmothrips longfellowi*.

well behind eyes, small and expanded at apex; maxillary stylets retracted to eyes, close together in middle of head. Pronotum transverse, anteromarginal seta absent; epimeral sutures complete; praepectus absent; fore tarsal tooth stout, fore tibia not armed. Fore wings without duplicated cilia. Abdominal tergites with two pairs of wing-retaining setae; sternite VIII of male without glandular area.

The species included in this genus are probably fungus-feeders living in dead galls or under bark and dead leaves. They are not primarily related to *Acacia* trees but are treated here because of their resemblance to certain members of the *Kladothrips* group. The two species *combustipes* and *fallax* are closely related and probably derived from one of the groups of thrips which live in leaf-litter, but the relationships of *folii* and *longfellowi* are not clear.

KEY TO THE SPECIES OF *EMPRESMOTHRIPS*

1 Pronotal posteroangular and midlateral setae present 2
– Pronotal posteroangular and midlateral setae absent 3
2 Prothorax and mesothorax darker than head and metathorax; B_1 on tergite IX more than half as long as tube; B_2 thorn-like with expanded apex; B_3 small and finely acute . . . . . ***folii*** (p. 403)
– Prothorax pale, pterothorax dark; B_1 on tergite IX about one third as long as tube; B_2 slender and expanded; B_3 expanded . . . . . ***longfellowi*** (p. 404)

3 Head yellow, maxillary stylets cross in middle of head; lateral mesonotal setae expanded . . . . . ***combustipes*** (p. 402)
– Head brown, maxillary stylets almost meet in middle of head; lateral mesonotal setae not developed . . . . . ***fallax*** (p. 402)

E. pallipes Karny, 1925 from Java does not belong in this genus as it has seven-segmented antennae, eleven duplicated cilia on the fore wing and the pronotal anteromarginal setae are well developed.

Empresmothrips combustipes Karny

Empresmothrips combustipes Karny, 1920 : 41.
Empresmothrips combustipes Karny; Karny, 1924 : 24.

The following notes are based on the unique holotype which is either micropterous or apterous. Measurements are given in microns.

♀. Colour yellow on head, metathorax, abdominal segment I, fore legs, mid femora and hind coxae; brown on mid tibiae, and hind tibiae and tarsi, hind femora dark in basal two-thirds; pronotum light brown, anterior of mesothorax darker; abdominal segments increasingly dark to tube; antennals I and II yellow, III–VIII increasingly dark.

Head, length 360; width behind eyes 310; width at base 290; postocular seta 52 long, apex 4 wide. Ocelli reduced; vertex with numerous fine setae pointing mesad, weakly reticulate at base. Pronotum smooth, epimeral sutures complete, anteroangular seta 55, epimeral seta 60. Lateral mesonotal seta, expanded 20 long. Metanotum with numerous fine setae. Pelta reticulate, 230 wide at base, 100 wide at apex; anterior border of tergite II 380–400 wide. Tergites each with transverse row of fine setae; tergite IX B_1 97; B_2 80; B_3 ?90, all expanded at apex. Tube, length 190; width at base 110; apical setae 190.

Material studied. Holotype ♀. Queensland: Christmas Creek, November (*E. Mjoberg*), in Riksmuseum Stockholm.

Empresmothrips fallax (Bagnall) comb. n.

(Text-figs 13 & 14)

Coenothrips fallax Bagnall, 1924 : 629–630.

♀ macropterous. Colour brown to dark brown, with red hypodermal pigment; tube darkest; mid and hind tarsi light brown, fore tarsi and apex of fore tibiae yellow; antennals I, II, VII and VIII brown, III–VI yellow-brown with brown apices; head and pronotal setae dark with hyaline tips, posterior abdominal setae pale; wings very weakly shaded, sub-basal setae colourless, cilia dark.

Dorsal surface of head faintly but completely reticulate, with about 15 pairs of fine 5μ setae between postocular setae and midline; postocular setae expanded, short (16–23μ), about 65μ behind eyes, sometimes reduced and little distinct from minor head setae; mouth cone rounded, maxillary palps about 40μ, maxillary stylets retracted to eyes and meeting in middle of head. Antennae eight-segmented, VIII closely united with VII by oblique suture; VII broad at base; VI broadly truncate at apex; III and V each with two ventral sense cones, IV with four sense cones (Text-fig. 14).

Pronotum transverse, weakly reticulate with about 15 pairs of minor setae; epimeral sutures complete; anteroangular and epimeral setae stout with expanded apices; praepectus absent; mesopraesternum complete, 200μ wide, rectangular laterally but anterior border eroded sub-medially. Fore femur stout, tibia slender and not armed, fore tarsus with a large tooth; coxal

seta similar to epimeral seta. Lateral mesonotal seta not developed; metanotum weakly reticulate with about seven pairs of fine setae. Fore wing not constricted medially, cilia closely set, no duplicated cilia; sub-basal setae poorly developed, ?B_2 15μ, ?B_3 80μ, both setae slender and acute.

Pelta longer than broad; tergites II–VII with two pairs of wing-retaining setae, on II–VI anterior pair much smaller than posterior pair, on VII both wing-retaining setae reduced; marginal seta B_1 close to posterior wing-retaining seta, tergites II–VI B_1 larger than posteroangular tergal seta; tergite IX B_1–B_3 with expanded apices; dorsal surface of tube with about seven longitudinal ridges in basal half, apex weakly constricted. Sternites with median transverse row of about 15 accessory setae 7μ long; sternal marginal setae reduced, median pair 10μ long, about 30μ from posterior margin, one lateral pair near margin 7μ long.

Measurements (in microns) of holotype. Body length (contracted) 2200. Head, length 320; width 240; mouth cone length 130; postocular seta 23. Pronotal shield, length 145; width 320; anteroangular seta 20; epimeral seta 50. Fore wing 1000. Pelta, length 130; basal width 100. Tergite IV, marginal B_1 70; posteroangular seta 35. Tergite IX, B_1 105; B_2 110; B_3 110. Tube, length 225; basal width 110; apical width 48; terminal setae ?170. Antennal segments length, 32; 60; 80; 77; 65; 65; 50; 16.

♂ macropterous. Colour, sculpture and chaetotaxy very similar to ♀, but postocular and pronotal anteroangular setae much longer (Text-fig. 13), and B_2 on tergite IX short. Sternites II–VII with an irregular transverse band of specialized reticulation anterior to the accessory setae, possibly glandular in function. Mesopraesternum boat-shaped but much narrower than in ♀, posterior width 65μ.

Measurements (in microns) of one male from Western Australia. Body length 2400. Head, length 320; width 220; postocular seta 50, distance behind eye 80. Pronotal shield, length 180; width 300; anteroangular seta 50; epimeral seta 30. Fore wing, length 900; median width 180. Tergite IX, B_1 ?100; B_2 55; B_3 165. Tube, length 210; basal width 90; apical width 45; terminal setae 210. Antennal segments length, 35; 55; 80; 77; 65; 65; 50; 16.

Material studied. Holotype ♀. Victoria: Healesville, in flower of *Erythraea australis*, 21.xii.1913 (*A. E. Shaw & R. Kelly*), in BMNH.

Australian Capital Territory: Canberra, Black Mountain; 1 ♀ in gall on *Eucalyptus* branch, 25.v.1961 (*E. M. Reed*); 1 ♂ swept from grasses, 8.xi.1960 (*E. M. Reed*), in ANIC. South Australia: Mt. Crawford State Forest, 1 ♀ swept from grasses and shrubs, 6.viii.1968 (*D. H. Colless*). Western Australia: Yanchep, 2 ♀, 2 ♂ on dead *Eucalyptus* leaves on cut branches, 29.ix.1967 (*L. A. Mound* 241), in BMNH.

The sexual dimorphism in this species of the head and pronotal setae and the structure of the mesopraesternum is particularly interesting. A single damaged female of a closely related species but with an unsculptured tube was collected by Froggatt at Euston, New South Wales, 25.ix.1928 and is deposited in the Australian National Insect Collection, Canberra.

Empresmothrips folii Girault

Empresmothrips folii Girault, 1928 (43) : 2.

This species is known from the unique male. Morphologically it is very similar to *longfellowi*, from which it can be distinguished by the characters given in the key. The original description was as follows: 'No accessories. Antennals 7, 8, prothorax,

front margin pterothorax, tube, last abdominal, cheeks, antennal 1, black, rest golden. Antennal 3 equal 6, a bit longer than 4. Scutum nearly smooth.'

MATERIAL STUDIED. Holotype ♂. QUEENSLAND: Taringa, galls on *Tristania* leaf, 1.x.1928 (*A. Girault*), in Queensland Museum.

Empresmothrips longfellowi Girault[1]

(Text-figs 4 & 15)

Empresmothrips longfellowi Girault, 1926 (34) : 1.

The original description states that the species was based on three males, but the only specimen in Girault's collection in the Queensland Museum is a female and this is labelled in the original author's hand as 'Type'. This specimen is here designated as LECTOTYPE. The following redescription is based on a male collected recently in Brisbane.

♂ hemimacropterous. Colour mainly yellow; light brown on anterior and lateral margins of head, external margins of fore femora, antennals I, II, VII and VIII, and apices of III–VI; dark brown on pterothorax, abdominal segments I and VIII–X, and basal half of hind tibiae. Wings clear, cilia dark. Major setae pale except postoculars and wing-retaining setae.

Anterior margin of head almost oval, projecting weakly in front of eyes, cheeks rounded to base; postocular setae broadly expanded (Text-fig. 7); maxillary stylets retracted almost to eyes, close together in middle of head; mouth cone short and rounded; antennal V asymmetric at apex, VII weakly narrowed at base (Text-fig. 15).

Pronotal midlateral and posteroangular setae small and slender but expanded at apex, 23μ long; pronotum apparently smooth, median thickening weak; mesopraesternum wide but slender. Mesonotal lateral setae expanded 16μ long; metanotum reticulate with about 5 pairs of fine setae. Fore wing sub-basal setae B_1 and B_2 expanded, 20μ long; B_3 fine and acute, 60μ long.

Pelta reticulate broad at base, 100μ long, 160μ wide. Tergites II–V with two pairs of sigmoid wing-retaining setae, these setae reduced on VI and VII. Posteroangular setae as long as marginal setae. Tergite IX marginal setae all expanded; tube evenly narrowed to apex. Sternites with a transverse row of about 15 accessory setae 10μ long; sternal marginals about 25μ long, median pair wide apart about 20μ from posterior margin; sternites II–VII with a pair of specialized reticulate areas in front of accessory setae.

Measurements (in microns). Body length 2500. Head, length 80; width 52; postocular setae 40, distance behind eye 50. Epimeral seta 40. Fore wing, length 550; width 65. Tergite IX, B_1 65; B_2 50; B_3 80. Tube, length 200; basal width 80; apical width 40; terminal setae 210. Antennal segments length, 50; 55; 110; 70; 65; 65; 45; 16.

MATERIAL STUDIED. LECTOTYPE ♀. QUEENSLAND: Wynnum, forest (*A. Girault*), in Queensland Museum.

QUEENSLAND: Brisbane, Mt. Nebo, 1 ♂ on *Acacia* sp. with pinnate leaves, 27.vii.1968 (*L. A. Mound* 792), in BMNH.

GRYPOTHRIPS Karny

Grypothrips Karny, 1924 : 27–28. Type-species: *G. mantis* by monotypy.

[1] While this paper was in press, the type-series of *Asemothrips picturatus* Hood, 1919 was studied in Washington and found to represent the same species as *longfellowi*. **Syn. n.**

Elongate, macropterous, dark species of Phlaeothripinae. Head long, in large individuals more than twice as long as wide; eyes large, anterior ocellus directed forwards; cheeks narrowed to base with several fine setae; mouth cone short and rounded, genae very strongly expanded in large specimens. Antennae arising on anterior margin of head, eight-segmented; III with one sense cone, IV with three sense cones; VIII very short closely united with VII. Pronotum broad, epimeral sutures complete; anteromarginal setae reduced, epimerals longer than other major setae; praepectus indicated by a deeply shaded group of fused chitinous islets: probasisternal plates large, each with stout posterior process; mesopraesternum reduced to two triangular sclerites. Both sexes with fore femora expanded except in gynaecoid individuals; fore tibia with apical tubercle, fore tarsal tooth as long as tarsal width. Mesonotal midlateral seta expanded; metanotum reticulate, median setae small. Fore wings with almost parallel sides, closely ciliate with 20–30 duplicated cilia; sub-basal setae B_2 and B_3 expanded, B_1 absent but an additional slender seta present posterior to B_3. Pelta reticulate, wider than long; tergites II–VI with two pairs of sigmoid wing-retaining setae, and anterolateral to these 2–4 pairs of accessory sigmoid setae; wing-retaining setae on VII reduced; tergite IX with B_1 and B_2 shorter than tube in both sexes; terminal setae black, longer than tube; sternite VIII of ♂ *mantis* with large glandular area.

Definition of this genus is complicated by the great range of size, and related variation in proportions, shown by the type-species *mantis*. The genus resembles the Kladothripina in the sense cone formula of the antennae and the armed fore tibiae and tarsi. However it does not appear to be on the same evolutionary line as the gall-forming *Kladothrips* or *Oncothrips* species, but is probably independantly derived from *Teuchothrips*-like ancestors. A similar long narrow head occurs in *Sacothrips* Moulton, 1968, but that genus has three or four sense cones on segment three, and four sense cones on segment four of the antennae. *Lichanothrips*, which is described below, has much broader fore wings and the maxillary stylets are very low in the head. The relationships of these genera are discussed under *Lichanothrips*.

Grypothrips mantis lives in leaf-mines of Lepidoptera, but has also been found beneath the cuticle of split young stems and as a secondary species within galls on *Acacia* trees. It is possible that this cryptic habit foreshadows the gall-forming habit of other Kladothripina. *Csirothrips*, *Warithrips* and *Dunatothrips* may also have a similar relationship with Lepidoptera, but these genera can be distinguished by a well developed praepectus and the absence of fore wing duplicated cilia.

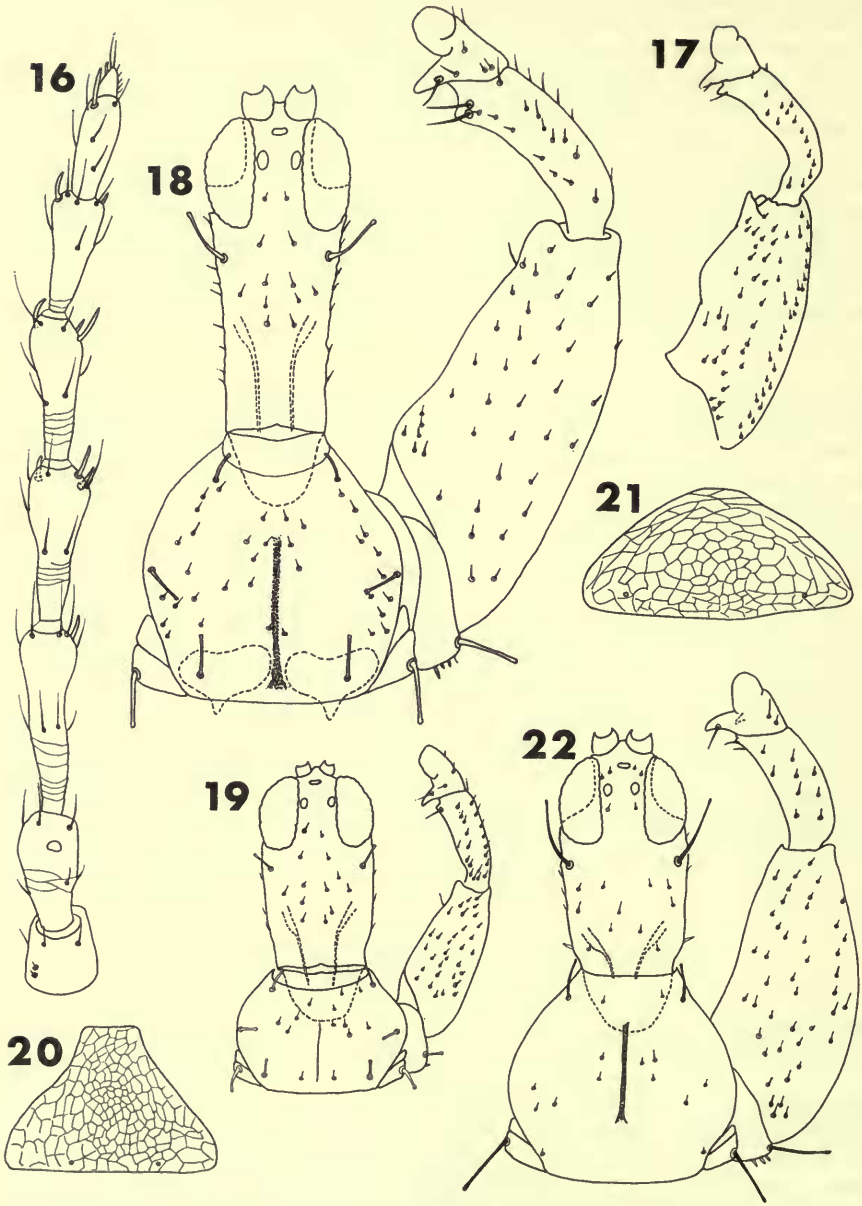
Key to the Species of *Grypothrips*

1 Tergite IX with B_1 and B_2 both expanded at apex; B_1 short, less than two-thirds as long as tube; fore tibial tubercle not at extreme apex of tibia (Text-fig. 18) ***mantis*** (p. 408)

– Tergite IX with B_1 acute at apex, more than two-thirds as long as tube; fore tibial tubercle at extreme apex of tibia close to fore tarsal tooth 2

2 Fore femur brown, apex broadly rounded; metanotum not reticulate between median setae but heavily reticulate in posterior half; B_1 and B_2 on tergite IX both acute and almost as long as tube; cheeks with a stout seta just in front of basal neck (Text-fig. 22) . . . . . ***clavisetae*** (p. 407)

– Fore femur yellow with brown external margins, with a stout tooth near inner apex (Text-fig. 17); metanotum reticulate medially as well as at posterior; B_2 on tergite IX expanded at apex; cheeks without a stout basal seta . . . ***curiosus*** (p. 407)



FIGS 16–22. 16 & 17. *Grypothrips curiosus*: 16, antenna. 17, fore leg. 18–20. *Grypothrips mantis*: 18, large female. 19, small female. 20, pelta. 21 & 22. *Grypothrips clavisetae*: 21, pelta. 22, head, pronotum and fore leg.

Grypothrips clavisetae (Girault) **comb. n.**

(Text-figs 21 & 22)

Adiaphorothrips clavisetae Girault, 1926 (34) : 1.

Adiaphorothrips is a synonym of *Machatothrips*, a genus of the Megathripinae (Mound, 1970*a* : 118), but Girault used the name for a wide range of Tubulifera with one or more pairs of cheek setae. The original description of *clavisetae* refers to four females and one male, although Girault subsequently used two of these specimens to describe *Adiaphorothrips citritarsus*, which is discussed above under the new genus *Akainothrips*. Of the remaining specimens on the type-slide, two are males of *Grypothrips mantis*, but the third specimen agrees with the description of *clavisetae* and is here designated as the LECTOTYPE female of that species.

♀ macropterous. Colour dark brown, fore tarsi and median longitudinal part of fore tibia golden yellow; antennals III–VII pale yellow with brown apex; major setae pale except terminal setae of tube; wings clear with dark cilia.

With the characters given above in the generic definition and key to species. Head shorter and pronotum less reticulate than similar-sized specimen of *mantis*. Pelta with rounded anterior margin (Text-fig. 21); posterior half of metanotum very coarsely reticulate.

Measurements in microns of holotype ♀. Body length 4000. Head, length 500; width behind eyes 270; postocular seta 165. Pronotal shield, length 385; median width 450; epimeral seta 130. Fore wing, length 1450; distal width 180; number of duplicated cilia 33. Tergite IX, B_1 320; B_2 350; B_3 320. Tube, length 350; terminal setae 350. Antennal segments length, 50; 74; 152; 120; 105; 97; 80; 30.

MATERIAL STUDIED. LECTOTYPE ♀. QUEENSLAND: Dalby, in forest, 10.ii.1924 (*A. Girault*), in Queensland Museum.

Grypothrips curiosus Girault

(Text-figs 16 & 17)

Gryptothrips [sic] *curiosus* Girault, 1927 (38) : 1.

♀ macropterous. Colour of tube and terminal setae dark brown, rest of body and head golden brown, fore legs and lateral margins of pronotum golden yellow, antennals III–VII yellow with brown apices; wings clear, cilia dark; major setae pale. With the characters given above in the generic definition and the key to species.

Measurements (in microns) of one ♀ from Goondiwindi. Body length 3800. Head, length 510; width behind eyes 260. Pronotal shield, length 260; median width 370; epimeral setae 90; midlateral and posteroangular setae 50. Mesonotal midlateral seta 55. Fore wing, length 1500; distal width 130; number of duplicated cilia 28; sub-basal setae 50. Tergite IX, B_1 225; B_2 240; B_3 260. Tube length 310; terminal setae 480. Antennal segments length, 55; 75; 130; 105; 97; 75; 70; 23.

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: Wallumbilla, on Brigalow [*Acacia harpophylla*], 17.x.1923 (*A. Girault*), in Queensland Museum.

QUEENSLAND: 5 miles north of Goondiwindi, 1 ♀ beaten from *Acacia ?harpophylla*, 16.vii.1968 (*L. A. Mound* 726), in BMNH.

Grypothrips mantis Karny
(Text-figs 18–20)

Grypothrips mantis Karny, 1924 : 28.

The individuals of this species vary greatly in size even within a single population. Males are rather smaller than females and also have a smaller size range, otherwise the two sexes are very similar. The largest and smallest females in a single series collected at Lake George, N. S. W. had body lengths of 4400μ and 3100μ, and head lengths of 550μ and 420μ. Moreover large body size is accompanied by hypertrophy of the fore femur, the fore tibial tubercles, the base of seta B_2 on tergite nine, and also the genae on either side of the mouth cone. Text-figs 18–19 and the measurements given below are taken from the largest and smallest females of this species that have been seen.

All the specimens from Canberra and Lake George have the seventh antennal segment dark, similar to the holotype from Lamington, Queensland. However, several specimens from near Parkes and Forbes, N. S. W. have the seventh antennal segment clear yellow in the basal half. This is not accepted here as indicating a difference between species, as in a population from near Walgett, N. S. W. all the individuals have the basal half of the seventh antennal segment light brown.

Measurements (in microns) of a large ♀ from Forbes, with a small female from Lake George in parentheses. Body length 4900 (2600). Head, length 550 (370); width across eyes 270 (200); postocular seta 120 (55). Pronotal shield, length 420 (185); median width 465 (300); epimeral seta 130 (60). Fore wing, length 1900 (1100); distal width 190 (100); number of duplicated cilia 34 (17); sub-basal setae 70 (30). Tergite IX, B_1 175 (115); B_2 165 (120); B_3 260 (175). Tube, length 320 (225); terminal setae 540 (330). Antennal segments length, 50 (32); 80 (58); 145 (80); 123 (77); 100 (68); 68 (60); 68 (57); 16 (16).

The glandular area on sternite VIII of the male occupies the whole of the sternite.

Measurements (in microns) of a large ♂ from Lake George. Body length 3300. Head, length 400; width across eyes 225; postocular seta 70. Pronotal shield, length 240; median width 350. Fore wing, length 1300; distal width 115; number of duplicated cilia 18. Tergite IX, B_1 152; B_2 130; B_3 190. Tube, length 240; terminal setae 350.

Material studied. Holotype ♀. Queensland: Glen Lamington, November (*Mjoberg*), in Riksmuseum, Stockholm. There is a ♀ with identical data labelled by Karny in Dr Priesner's collection, although the original description refers to a single specimen.

New South Wales: Lake George, 25 miles NE of Canberra, 12 ♀, 5 ♂ in Lepidoptera mine on *Acacia implexa* phyllode, 31.i.1968 (*L. A. Mound* 463); 15 miles NE of Walgett, 3 ♀, 4 ♂ in split stems of *Acacia stenophylla*, 5.vi.1968 (*L. A. Mound* 663); 10 miles south of Parkes, 1 ♀ in gall on *Acacia pendula*, 8.iii.1968 (*L. A. Mound* 540); 19 miles south of Forbes, 3 ♀ in shrivelled galls on *A. pendula*, 7.iii & 6.vi.1968 (*L. A. Mound* 532 & 676); 23 miles south of Gilgandra, 1 ♀ in small dead gall, 1 ♂ in split stem of *A. pendula*, 6.vi.1968 (*L. A. Mound* 673 & 680), in BMNH; Parkes, 5 ♀ between leaves in webbing of caterpillar, 7.viii.1959 (*E. M. Reed*), in ANIC. Australian Capital Territory: Black Mountain, Canberra; 4 ♀, 3 ♂ in leaf mine of *Labdia semnostola*—Cosmopterygidae (det. I. Common) on *Acacia implexa*, 29.i,

7.iv & 5.v.1968 (*L. A. Mound* 454, 624 & 648); 3 ♀ between phyllodes of *A. implexa* webbed by *Acropolites dryinodes*—Tortricidae (det. I. Common), 5.v.1968 (*L. A. Mound* 649 & 650), in BMNH; 5 ♀, 9 ♂ on *Acacia longifolia*, 21.i.1964 (*E. M. Reed*), in ANIC.

KATOTHRIPS gen. n.

Type-species: *Kladothrips tityrus* Girault.

Small to medium sized, pale or brown species of Phlaeothripinae. Head longer than broad, cheeks without major setae, weakly constricted behind eyes, parallel or weakly concave; postocular setae far behind eyes, or not developed; maxillary bridge present, although not always heavily sclerotized; mouth cone rather broadly rounded. Antennae on anterior margin of head or slightly ventral; antennal III with one sense cone which usually arises on ventral surface, IV with three (or two) sense cones; apex of VI broadly truncate, VII and VIII closely united. Pronotum wider than long, epimeral sutures complete; epimeral setae widely expanded, remaining major setae not developed except in *tityrus*; praepectal plates present or absent, mesopraesternum reduced to two lateral triangles; fore femora enlarged, fore tibia with an apical tubercle in three species; fore tarsus with a tooth in both sexes. Mesonotal midlateral setae small in *tityrus*, not developed in other species; metanotal setae small and acute. Fore wings, when present, parallel-sided, rather weak, without duplicated cilia except in *duplex*. Tergites II–VII with two pairs of wing-retaining setae, these are usually reduced on VII; B_1 and B_2 on tergite IX short and expanded; sides of tube frequently convex, narrowed to apex, terminal setae fine and usually short; terminal aperture of tube constricted, occupying about one third of terminal diameter. Sternite VIII of male *tityrus* with transverse glandular area anterior to accessory setae.

As is clear from the above definition, the species included in this new genus are rather diverse. The group probably represents the basal stock from which both *Dactylothrips* and *Oncothrips* have been derived. *K. tityrus* is the largest of the species included, and in some ways is the most specialized, whereas *duplex* can be regarded as the least specialized. All six species have the terminal aperture of the tube constricted as in *Dactylothrips*, and both *duplex* and *brunneicorpus* have indications of the longitudinal sutures which are typical of the tergites of *Dactylothrips*. The species included in both these genera have a broadly rounded mouth cone, rather heavily sclerotized posterior abdominal segments, the praepectal plates either present or absent, a tendency for reduction of the major pronotal setae, and a tendency for the tube to be aberrant and non-tubular in shape. In *Dactylothrips* species the maxillary stylets are close together in the middle of the head, the antennae arise on the anterior margin of the head, and the fore wings lack duplicated cilia. In the first two of these characters *Katothrips* is more similar to *Oncothrips*, although in the latter genus the maxillary bridge is even less well sclerotized. The ventral position of the sense cone on the third antennal segment is most unusual, although there is a tendency in both *Dactylothrips* and *Oncothrips* for the antennal sense cones to be ventrolateral. The generic name is derived from the Greek *kato*, meaning beneath or below, and refers to the position of the sense cones.

The species of *Katothrips* probably live in cryptic situations on *Acacia* trees such as in leaf-mines or tied leaves, or in galls. However, they are not primary gall

producers. Careful examination of such habitats in Australia, including Hymenoptera and fungus galls, will undoubtedly produce more species.

KEY TO THE SPECIES OF *KATOTHRIPS*

1 Fore tibia with a small tubercle at inner apex 2
– Fore tibia without an apical tubercle
Postocular and pronotal major setae not developed, except epimerals . . 4
2 Postocular setae not developed (Text-fig. 30); pelta slender, 1·3 times as long as wide (Text-fig. 38); fore wing with duplicated cilia . . . . . ***duplex*** (p. 413)
– Postocular setae well developed, far behind eye; pelta as wide, or wider than long; fore wing, when present, without duplicated cilia 3
3 Pronotal anteroangular, midlateral and posteroangular setae not different from pronotal discal setae (Text-fig. 25); terminal setae less than half as long as tube; pelta triangular (Text-fig. 39) . . . . . ***brunneicorpus*** (p. 412)
– Pronotal major setae expanded, about half as long as epimeral setae (Text-fig. 23); terminal setae more than half as long as tube; pelta broadly rounded (Text-fig. 40) ***tityrus*** (p. 410)
4 Tube more than 1·5 times as long as maximum width, sides straight (Text-fig. 29); terminal setae longer than tube . . . . . ***yamma*** (p. 416)
– Tube less than 1·3 times as long as maximum width, sides convexly narrowed to apex (Text-figs 27 & 28); terminal setae shorter than tube. 5
5 Antennal IV with two sense cones (Text-fig. 35) . . . . . ***hyrum*** (p. 414)
– Antennal IV with three sense cones (Text-fig. 36) . . . ***pendulae*** (p. 414)

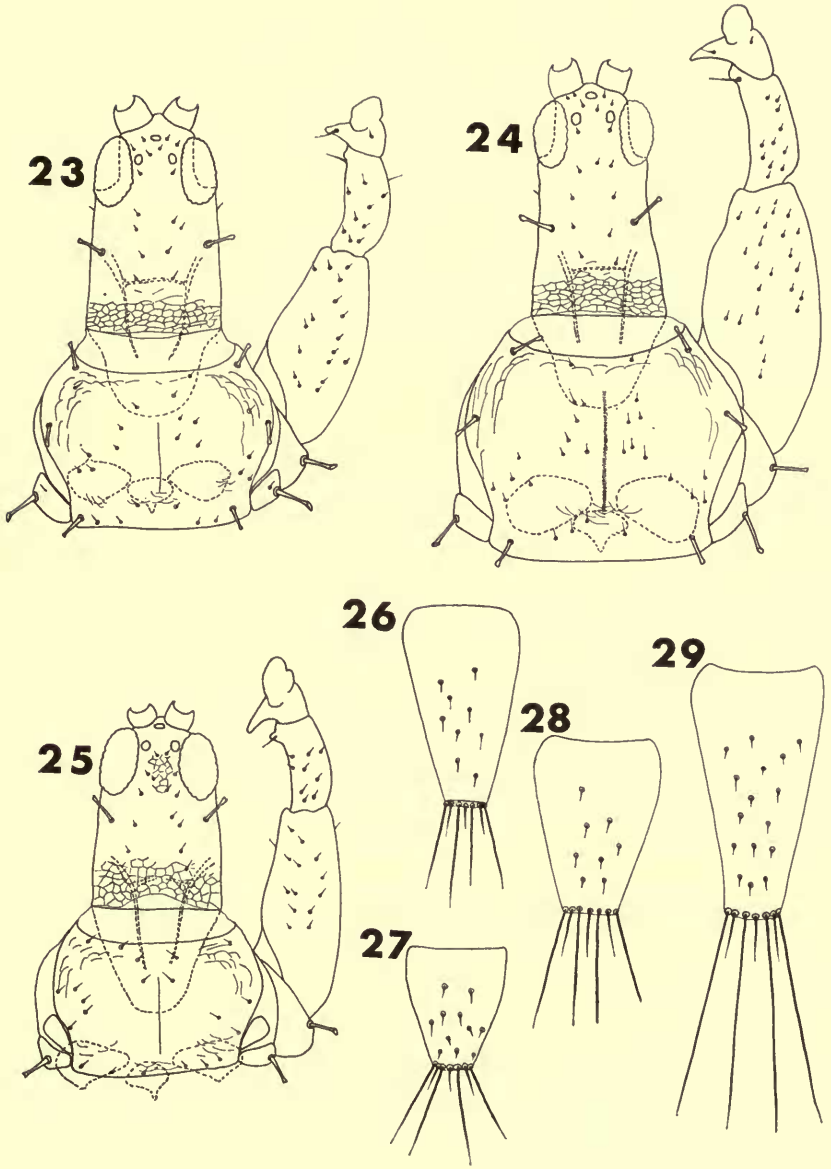
Katothrips tityrus (Girault) **comb. n.**

(Text-figs 23, 24, 33 & 40)

Kladothrips tityrus Girault, 1928 (43) : 1.
Kladothrips acallurus Bagnall, 1932 : 507–509. **Syn. n.**
Kladothrips differens Bagnall, 1932 : 509. **Syn. n.**

Girault compared this species briefly with *Kladothrips augonsaxxos*. There is a single specimen in both the British Museum (Natural History) and the Victorian Museum, Melbourne which bear identical data to the holotype of *tityrus*, although these were labelled by R. Kelly as *Kladothrips rodwayi*. The unique holotype of *differens* is a very large hemimacropterous male, and the lectotype of *acallurus* is a large macropterous (dealate not apterous cf. Bagnall) female. A long series of this species from Lake George, N. S. W. has shown that the head is longer in oedymerous than in gynaecoid individuals, and moreover the head of the male is more constricted medially (Text-figs 23 & 24). Females occur as either macropterae or hemimacropterae although only hemimacropterous males are known. However the oedymerism is not related to the two wing lengths. This type of variation should be contrasted with that of *Oncothrips tepperi* in which wing length is continuously variable and is closely related to the degree of oedymerism.

K. tityrus is very similar to *brunneicorpus* described below, but in that species the pronotal major setae are not differentiated from the discal setae except for the epimerals. The species does not produce galls but has been found in the galls of chalcid wasps, and in Lepidopterous leaf-mines and tied phyllodes on *Acacia* trees.



FIGS 23–29. *Katothrips* species. 23–25. Head, pronotum and fore leg: 23, *tityrus* female. 24, *tityrus*, male. 25, *brunneicorpus*, female. 26–29. Tube: 26, *duplex*. 27, *hyrum*. 28, *pendulae*. 29, *yamma*.

The larvae are yellow with a dark head and legs, and a bright median longitudinal stripe of red hypodermal pigment.

♀ macropterous or hemimacropterous. Colour brown; yellow tarsi and apices of tibiae; antennal III and distal half of II yellow, IV yellow brown, V and base of VI light brown; posterior of pterothorax and lateral parts of abdominal tergites golden, tergites III–VII with dark median area behind antecostal ridge; fore wing and major setae colourless.

Measurements (in microns) of a large macropterous ♀ and a small hemimacropterous ♀ from Lake George. Body length 2800 (2350). Head, 370 (300); median width 170 (160); postocular seta 40 (40). Pronotal shield, length 270 (210); median width 370 (305); epimeral seta 58 (55); anteroangular seta 35 (30). Fore wing, length 1150 (450); distal width 115; sub-basal setae 50. Mesonotal lateral seta 16. Tergite IX, B_1 87 (71); B_2 87 (71); B_3 160 (150). Tube, length 225 (195); terminal setae 210 (200). Antennal segments length, 50 (42); 65 (60); 70 (58); 65 (52); 65 (52); 65 (55); 65 (55); 16 (16).

♂ hemimacropterous. Colour and structure similar to female but head more slender; sternite VIII with transverse glandular area in front of accessory setae.

Measurements (in microns) of one large and one small male from Lake George. Body length 2250 (2100). Head, length 320 (290); median width 145 (145) postocular seta 50 (42). Pronotal shield, length 270 (240); median width 370 (350); epimeral seta 52 (45). Fore wing 390 (390). Tergite IX, B_1 67 (67); B_2 67 (67); B_3 155 (145). Tube, length 160 (160); terminal setae 170 (175).

Material studied. Holotype ♀. Victoria: Box Hill, near Melbourne, on leaves of *Acacia melanoxylon*, 5.iv.1928 (*R. Kelly*), in Queensland Museum. There is a female with identical data in both BMNH and the Victoria Museum, Melbourne.

Holotype ♂ of *differens*. Victoria: (R. Kelly N.S. ?133), in BMNH.

Lectotype ♀ of *acallurus* with 1 ♂, 2 ♀. Victoria: (R. Kelly NS 133), in BMNH.

New South Wales: Lake George, 25 miles east of Canberra, 25 ♀ (5 hemimacropterous), 6 ♂ in Lepidoptera mine on phyllode of *Acacia implexa*, 31.i.1968 (*L. A. Mound* 463), in BMNH; Manly, near Sydney, 7 ♀ in Chalcid gall on *Acacia longifolia*, ii.1925, in N.S.W. Dept. of Agriculture. Australian Capital Territory: Bendora at 4000 feet, 7 ♀ (3 hemimacropterous) in tied leaves on *Acacia melanoxylon*, 14.ii.1968 (*L. A. Mound* 497), in BMNH. Queensland: Brisbane, 22.v.1958 (*D. Campbell*), in University of Queensland.

Katothrips brunneicorpus (Girault) comb. n.

(Text-figs 25, 37 & 39)

Polyphemothrips brunneicorpus Girault, 1927 (35): 3.

♀ macropterous. Colour brown, abdominal segments I and II and lateral areas of III and IV golden, dark median area on tergites III–VII behind antecostal ridge; tarsi yellow, fore tibiae and mid and hind legs yellow-brown; antennal III yellow, IV and V, apex of II and base of VI light brown, I, VII and VIII brown; major setae and fore wings pale, cilia not dark.

Cheeks weakly constricted behind eyes but bulging near base; postocular setae well developed, maxillary stylets low in head (Text-fig. 25). Antennal IV with three sense cones, but the two ventral ones are widely separated (Text-fig. 37). Praepectus present but close under mouth cone. Metanotum broadly reticulate. Pelta triangular (Text-fig. 39). Tergites III–VII with a pair of longitudinal weakly sclerotized areas just mesad of wing-retaining setae; tergite VII with two pairs of well developed wing-retaining setae; margins of tube not straight, terminal aperture constricted.

Measurements (in microns) of ♀ from Laurieton with holotype in parentheses. Body length 1800 (1900). Head, length 225 (275); width behind eyes 135 (145); postocular setae 38 (55). Pronotal shield, length 145; median width 250; epimeral seta 47. Fore wing, length 700; distal width 70; sub-basal seta 30. Tergite IX, B_1 64; B_2 55; B_3 90. Tube, length 125; terminal setae 52. Antennal segments length, 32; 50; 48; 52; 48; 48; 55; 20.

MATERIAL STUDIED. Holotype ♀ (not ♂ cf. Girault). QUEENSLAND: Nelson [Gordonvale], forest, in Queensland Museum.

QUEENSLAND: Mt. Gravatt [Brisbane], 11 May 1923, 1 ♀ in forest; North Queensland without further data, 1 ♀ (labelled as ♂ paratype), in Queensland Museum. NEW SOUTH WALES: Laurieton, on *Acacia* sp., 26.x.1960 (*E. M. Reed*), in ANIC.

This species is intermediate between *tityrus* and the other species of this genus in the development of the postocular setae and the complete absence of pronotal major setae except the epimerals. However *brunneicorpus* has a pair of praepectal plates almost concealed beneath the mouth cone, although the anterior part of the prothoracic sternum of *tityrus* is quite membranous. The variation in head shape of the two species is very similar and the Text-figures are of the short-headed female from Laurieton.

Katothrips duplex sp. n.

(Text-figs 26, 30, 34 & 38)

♀ macropterous. Colour brown, tube dark; tarsi and apices of tibiae yellow; anterior abdominal segments golden brown with dark brown median area behind antecostal ridge; antennals III–V, base of VI and apex of II light brown to yellowish; fore wings and major setae pale, cilia not very dark.

Antennal IV with ventral sense cones not close together (Text-fig. 34). Head with cheeks parallel, stylets retracted almost to eyes; maxillary bridge pale but stout. Postocular and pronotal major setae (except epimerals) not distinguished from microsetae. Paired elongate sclerites on prothoracic sternum close to mouth cone apparently represent praepectus (Text-fig. 30). Metanotum elongate reticulate; pelta elongate (Text-fig. 38). Tergal posteroangular setae on II–VI shorter than B_1 marginal seta; tergites III–VII with a pair of longitudunal weakly sclerotized areas just mesad of wing retaining setae; sides of tubes not straight, terminal aperture constricted (Text-fig. 26).

Measurements (in microns) of holotype. Body length 2100. Head, length 260; median width 155. Pronotal shield, length 160; median width 255; epimeral seta 30. Fore wing, length 800; distal width 70; sub-basal setae 28; number of duplicated cilia 7–9. Tergite IX, B_1 & B_2 26; B_3 130. Tube length 130; terminal setae 80. Antennal segments length, 32; 50; 45; 45; 44; 42; 50; 16.

MATERIAL STUDIED. Holotype ♀. SOUTH AUSTRALIA: Willunga, 28 miles south of Adelaide, in *Acacia retinodes* flowers, 14.i.1968 (*L. A. Mound* 453), in ANIC.

Two paratype females, collected with the holotype, in BMNH.

The other five species included in this genus do not have duplicated cilia on the fore wing, but three of these species do have a weakly developed praepectus. *K. duplex* is intermediate between *Oncothrips* (fore wing duplicated cilia present, praepectus absent, antennal IV with two sense cones, fore tibia unarmed) and *Dactylothrips* (fore wing duplicated cilia absent, antennal IV with two sense cones,

praepectus and fore tibial tubercle present or absent). *Katothrips* species appear to belong to a generalized group, none of which produce galls, but from which the more highly specialized gall producers have been derived.

Katothrips hyrum sp. n.

(Text-figs 27, 31 & 35)

♀ macropterous. Colour brown, apex of abdomen dark; tarsi and apices of fore tibiae yellow; antennal III and apex of II yellow-brown, IV–VIII as dark as head; major setae and fore wings pale, cilia pale. Cheeks weakly convex, postocular setae not larger than other head setae; maxillary stylets retracted to postocular setae. Antennae short, IV about as long as wide with two sense cones (Text-fig. 35). Praepectus and spinasternum absent, mesopraesternum very reduced. Fore tibia short with no apical tubercle (Text-fig. 31). Metanotum longitudinally reticulate; pelta slender; wing-retaining setae reduced on tergite VII; tube almost beehive-shaped with convex sides, terminal setae short (Text-fig. 27).

Measurements (in microns) of holotype. Body length 1600. Head, length 210; median width 130. Pronotal shield, length 135; median width 193; epimeral setae 26. Fore wing, length 580; distal width 60; sub-basal seta 13. Tergite IX, B_1 20; B_2 42; B_3 80. Tube, length 75; maximum width 65; terminal setae 65. Antennal segments length, 26; 45; 32; 29; 29; 29; 39; 10.

♀ hemimacropterous. Very similar to holotype but with reduced pterothorax and pelta; forewing without cilia, length 210μ.

Material studied. Holotype ♀. New South Wales: 23 miles south of Gilgandra, in small phyllode gall on *Acacia pendula* (? or *oswaldi*), 6.vi.1968 (*L. A. Mound* 672), in ANIC.

Paratype hemimacropterous female collected in same gall as holotype, in BMNH.

The gall in which this species was collected was less than 5 mm deep. It is possible that this was an abandoned, poorly developed gall of *Oncothrips tepperi*, and that the host plant was *Acacia oswaldi*. In the field the author identified the tree as a poorly grown specimen of *pendula*, which was the dominant species in the vicinity. The small, almost beehive-shaped tube of *hyrum* with the terminal aperture constricted is very similar to that of *Dactylothrips marsupium*.

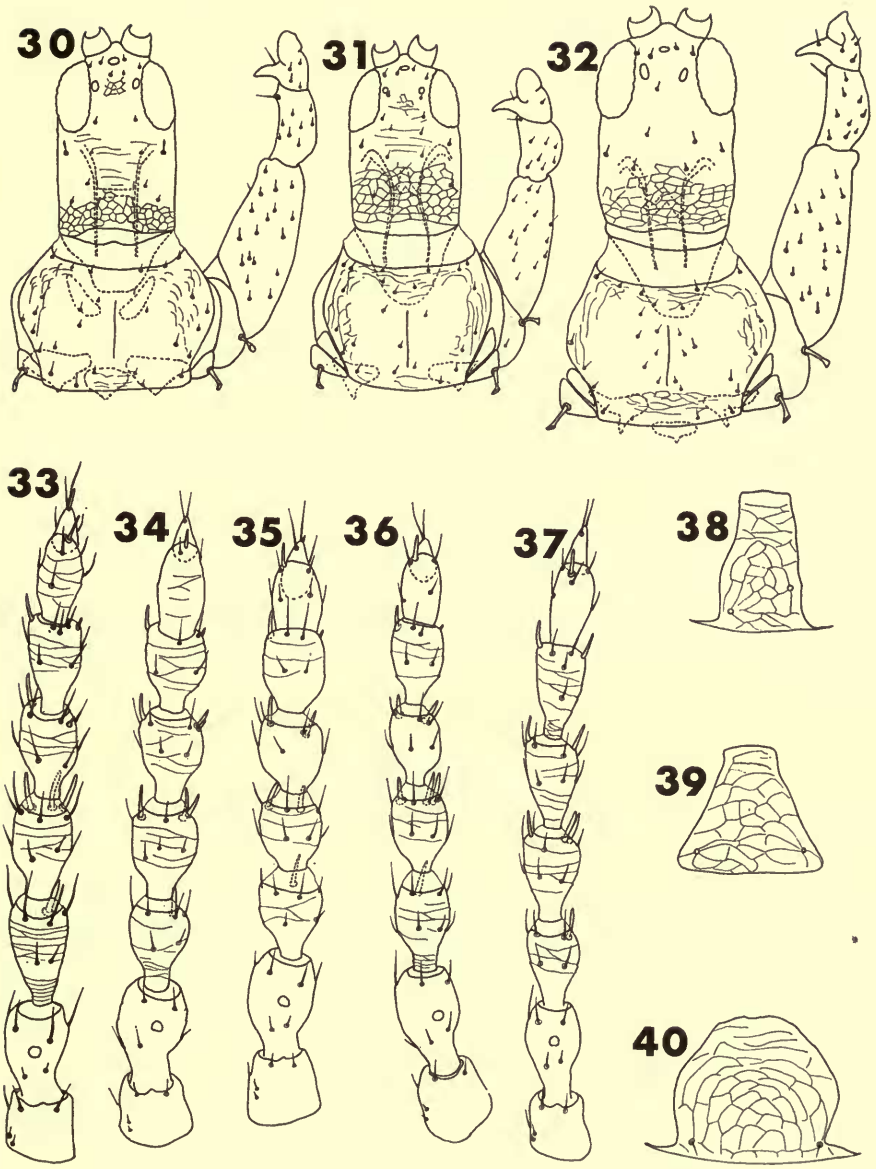
Katothrips pendulae sp. n.

(Text-figs 28, 32 & 36)

♀ macropterous. Colour pale yellowish brown, shaded along external margins of legs, tergites III–VII with a median dark area behind antecostal ridge; segments VIII and IX brown, tube dark brown; antennals I and III yellow, II and IV with brown markings, V and VI pale basally, VII and VIII dark; major setae and fore wings pale.

Cheeks weakly convex, stylets not deeply retracted into head (Text-fig. 32). Antennal IV with three ventral sense cones (Text-fig. 36). Praepectus and spinasternum present. Metanotum with no sculpture laterally; pelta slender; wing-retaining setae on tergite VII reduced; tube margins convex (Text-fig. 28).

Measurements (in microns) of holotype. Body length 2000. Head, length 255; median width 160. Pronotal shield, length 160; median width 270; epimeral seta 35. Fore wing, length 800; sub-basal setae 23. Tergite IX, B_1 45; B_2 58; B_3 100. Tube, length 97; maximum width 80; terminal setae 80. Antennal segments length, 26; 50; 54; 45; 45; 43; 50; 16.



FIGS 30–40. *Katothrips* species. 30–32. Head, pronotum and fore leg: 30, *duplex*. 31, *hyrum*. 32, *pendulae*. 33–37. Antenna: 33, *tityrus*. 34, *duplex*. 35, *hyrum*. 36, *pendulae*. 37, *brunneicorpus*. 38–40. Pelta: 38, *duplex*. 39, *brunneicorpus*. 40, *tityrus*.

MATERIAL STUDIED. Holotype ♀. NEW SOUTH WALES: Hillston, between leaves of *Acacia pendula*, 22.ix.1959 (*E. M. Reed*), in ANIC with wings on separate microslide.

Paratype ♀. NEW SOUTH WALES: 19 miles south of Forbes, in gall on *Acacia pendula*, 6.vi.1968 (*L. A. Mound* 677), in BMNH.

The head of this species is very similar to that of *yamma* described below, but the tube is closely similar to *hyrum* described above.

Katothrips yamma sp. n.

(Text-fig. 29)

♀ macropterous. Colour yellowish with faint brown shadings, antennals VII and VIII darker, distal three-quarters of tube dark brown. Structure of head, antennae, fore legs, pronotum, praepectus and pelta, and sculpture of metanotum very similar to *pendulae* described above. However, tube is long with almost straight sides and terminal setae longer than tube (Text-fig. 29); sternites VI and VII with a transverse band of linear markings between accessory setae and antecostal ridge.

Measurements (in microns) of holotype. Body length 2200. Head, length 260; median width 165. Pronotal shield, length 195; median width 260; epimeral seta 35. Fore wing broken, sub-basal seta 19. Tergite IX, B_1 23; B_2 26; B_3 80. Tube, length 140; maximum width 77; terminal setae 160. Antennal segments length, 32; 50; 45; 43; 48; 48; 55; 13.

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: 20 miles north of Durham Downs, SE of Lake Yamma Yamma, in galls of *Kladothrips ellobos* on *Acacia cambagei*, 13.ii.1968 (*R. Lewis*), in ANIC.

The fore wings of the unique holotype are missing beyond the basal third. This species is very similar to *pendulae* but is readily distinguished by the normal form of the tube.

KELLYIA Bagnall

Kellyia Bagnall, 1929*b* : 188–189. Type-species: *Teuchothrips hoodianus*, by monotypy.
Kellyia Bagnall; Mound, 1968 : 128.

Large black macropterous species of Phlaeothripinae. Head moderately long, at least 1·5 times as long as wide; eyes large, longer on dorsal surface than on ventral; ocelli not directed forwards, antennae on anterior border of head; postocular setae well developed; mouth cone rounded; maxillary stylets retracted to eyes, meeting in middle of head. Antennae eight-segmented, III more than 4 times as long as wide with one sense cone; IV with three sense cones; VII and VIII closely joined. Pronotum transverse, about 0·5 as long as head in female and small males, but in oedymerous males almost 0·7 as long as head; four pairs of major setae developed, anteromarginals usually absent; epimeral sutures complete; fore femur stout, fore rarsus with a tooth in both sexes. Praepectus absent; mesopraesternum sexually dimorphic, anterior border of mesosternum much narrower in oedymerous males than in minor males and females. Lateral mesonotal setae expanded; metanotum reticulate with median setae slender and far apart. Fore wings slightly wider distally, cilia closely set, more than 20 duplicated cilia; sub-basal setae B_1 and B_2 short and expanded, B_3 short and acute. Pelta reticulate, triangular but usually with apex transverse; tergites II–VI with two pairs of wing-retaining setae, on VII these setae reduced; tergite IX with moderately long setae; tube shorter than head, margins straight; terminal setae pale. Sternites with median transverse row of accessory setae, marginal setae not half as long as sternite: males with glandular area on sternite VIII.

This genus is an offshoot of the *Teuchothrips* complex of species which cause leaf-roll galls on a wide range of plants in Australia, e.g. *Bursaria, Callistemon, Myoporum, Pittosporum, Stenocarpus*. *Kellyia* can be distinguished from *Teuchothrips* by the rather elongate head with the maxillary stylets meeting medially, and the long third antennal segment. The genus was placed in the Kladothripina by Priesner (1960 : 293) but is better placed in the Hoplothripina with *Teuchothrips* and such leaf-rolling genera as *Eugynothrips* and *Tolmetothrips*. *Kladothrips* is undoubtedly derived from this group, with *Oncothrips* and *Neocecidothrips* standing in an intermediate position. The two species placed in this genus have both been collected from galls, although they are not gall-forming insects. They have been found breeding in the galls of hymenoptera, but it is not possible to know if they feed on plant tissue or on fungus or are predatory on some other inquiline such as a mite species.

Key to the Species of *Kellyia*

1 Glandular area on sternite VIII of male forms a transverse median band (Text-fig. 45); tergite IX seta B_2 of male about half as long as B_1; pronotal anteromarginal setae developed in female; tarsal tooth of female small; tube relatively long, more than 1·5 times as long as B_1 on tergite IX; apex of antennal V normal (Text-fig. 63) ***hoodianus*** (p. 417)

– Glandular area on sternite VIII of male occupies most of sternite but is divided into two by median longitudinal band (Text-fig. 46); tergite IX seta B_2 of male about as long as B_1; pronotal anteromarginal seta not developed in male or female; tarsal tooth of female two-thirds as long as tarsal width; tube relatively short, less than 1·5 times as long as B_1 on tergite IX; apex of antennal V drawn out ventrally (Text-fig. 64) . . . . . ***biadenes*** (p. 418)

Kellyia hoodianus (Bagnall)

(Text-figs 45 & 63)

Teuchothrips hoodianus Bagnall, 1924 : 630–631.
Mesothrips atrellus Girault, 1927 (36) : 2. **Syn. n.**
Kellyia hoodianus (Bagnall) Bagnall, 1929*b* : 188–189.
Kellyia hoodianus (Bagnall); Mound, 1968 : 129.

♂ macropterous. Colour dark brown, posterior of abdomen black, with red hypodermal pigment; fore tarsi and antennal II light brown; clear yellow in basal two-thirds of antennal III and bases of IV and V; wings clear, cilia dark; major setae shaded on head, pronotum and tergite IX B_2, rest clear. With the morphological characters given in the generic definition and key above; glandular area on sternite VIII extends fully across sternite, curves to anterior near lateral margins.

Measurements (in microns) of lectotype, with a minor male from Bell, N. S. W. and a major male from Melbourne, Victoria in parentheses. Body length 3300 (3000–3800). Head, length 420 (380–450); width 260 (230–260); postocular seta 90 (70–100). Pronotum, length 200 (150–280); median width 380 (340–440); mesosternal anterior border 130 (150–130). Fore wing, length 1200 (950–1300); maximum width 130 (90–150); sub-basal B_1 35 (32–45); number of duplicated cilia 22 (13–25). Tergite IX, B_1 195 (170–195); B_2 110 (95–110); B_3 160 (145–160). Tube, length 290 (265–300); terminal setae 260 (235–270). Antennal segments length, 40; 65; 160; 110; 80; 65; 65; 30.

♀ macropterous. Colour and structure similar to male except for the wide mesopraesternum and mesosternum anterior border, also the pronotal anteromarginal setae are as long as the anteroangulars.

Measurements (in microns) of large female from Melbourne. Body length 4300. Head, length 470; width 270; postocular seta 65. Pronotum, length 200; median width 410; meso. sternum anterior border 230. Fore wing 1300; width 140; number of duplicated cilia 20-Tergite IX, B_1 190; B_2 160; B_3 175. Tube length 330; terminal setae 300. Antennal segments length, 50; 70; 190; 115; 95; 65; 80; 30.

MATERIAL STUDIED. Lectotype ♂ (with paralectotype ♂). VICTORIA: Lake Tyers, *Acacia elata*, 21.ii.1919 (*R. Kelly*), in BMNH.

VICTORIA: Melbourne, Blackburn Lake Reservoir, 5 ♀, 1 ♂, 2 instar II in Hymenoptera galls on *Acacia baileyana*, 17.xi.1967 (*L. A. Mound* 371), in BMNH. NEW SOUTH WALES: Mittagong, 1 ♀, 1 ♂ sweeping, 1905 (*Kaebele*); Sydney, 1 ♂, 11.ii.1905; Pennant Hills near Sydney, 1 ♀ on *Themeda australis*, 26.i.1959 (*E. M. Reed*); Bell, 1 ♂ on *Acacia botrycephala*, 17.ix.1959 (*M. Casimir*), in ANIC.

The specimens collected by the author at Blackburn Lake, Melbourne were very active in life. When disturbed, they attempted to crawl into the crevices and emergence holes of the galls. The larvae have bright red transverse bands of hypodermal pigment, and the head, pronotum, antennae and last two abdominal segments are black. Girault's species *atrellus* was published with the data 'Enoggera, forest 10.xii.1921'. The holotype is not in Girault's collection at Brisbane, and the above synonymy is based on a female labelled by Girault from 'Wynnum, forest, Nov.'

Kellyia biadenes sp. n.

(Text-figs 10, 46 & 64)

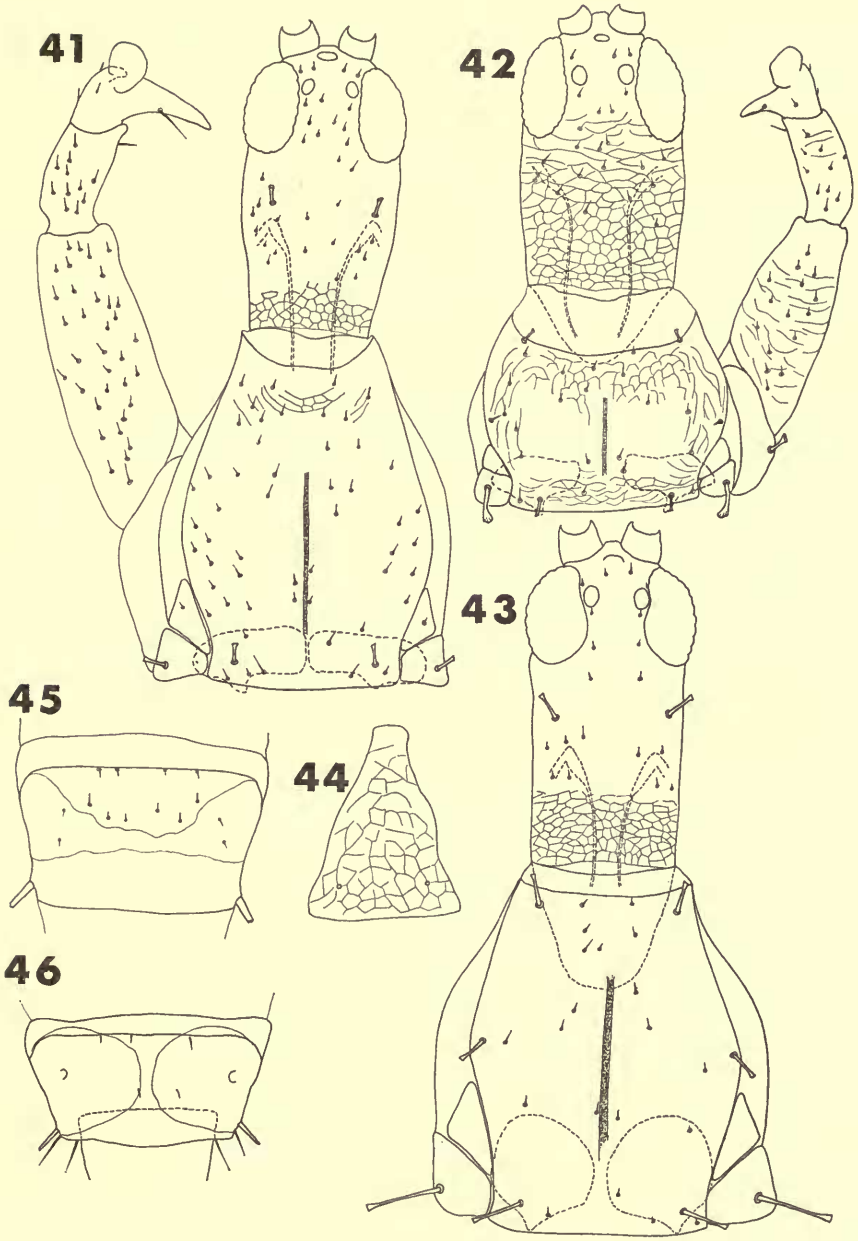
♂ macropterous. Dark brown to black, fore tibiae light brown, fore tarsi yellowish, antennals I, VII and VIII light brown, III–VI yellow-brown with light brown apices; fore wings pale, weakly shaded along hind margins, cilia dark; major setae weakly shaded, postocular darkest. With the morphological characters given in the generic definition and key to species above.

Measurements (in microns) of holotype with small and large male in parentheses. Body length 3000 (2600–3500). Head, length 380 (340–390); width 230 (230–250); postocular seta 90 (70–110). Pronotal shield, length 200 (165–250); median width 340 (300–450); mesosternum anterior border 130 (150–120). Fore wing, length 1140 (1020–1260); maximum width 130 (100–140); number of duplicated cilia 20 (19–21). Tergite IX, B_1 175 (175–225); B_2 160 (165–195); B_3 170 (175–220). Tube, length 225 (260–275); terminal setae 290 (?–320). Antennal segments length, 45; 65; 130; 110; 80; ?65; ?65; ?28.

♀ macropterous. Colour and structure very similar to male except for wide mesopraesternum.

Measurements (in microns) of allotype. Body length 3800. Head, length 440; width 280; postocular seta 70. Pronotal shield, length 220; median width 380; mesosternum anterior border 240. Fore wing, length 1300; maximum width 130; number of duplicated cilia 24. Tergite IX, B_1 210; B_2 210; B_3 200. Tube, length 275; terminal setae 310. Antennal segments length, 50; 80; 160; 130; 97; 70; 65; 26.

MATERIAL STUDIED. Holotype ♂. QUEENSLAND: Sandgate, in multilocular galls of a Pteromalid (Hymenoptera) on an undetermined plant, 4.x.1965 (*T. Weir*) in Brisbane Museum.



FIGS 41–46. 41. *Kladothrips ellobus*. 42. *Oncothrips habrus*. 43. *Kladothrips augonsaxxos*, head and pronotum. 44. *Kladothrips rugosus* pelta. 45 & 46. Glandular area on sternite VIII of *Kellyia* male — *hoodianus*. 46, *biadenes*.

Allotype ♀, with 3 ♀, 4 ♂ paratypes collected with holotype. Paratypes have been deposited in ANIC, BMNH and the University of Queensland.

This material was loaned by the University of Queensland Department of Entomology. The dried galls contained very large numbers of eggs of the thrips as well as cast larval skins.

KLADOTHRIPS Froggatt

Kladothrips Froggatt, 1906 : 1011. Type-species: *K. rugosus*, by monotypy.
Kladothrips Froggatt; Bagnall, 1929*b* : 194.

Macropterous, bicoloured species of Phlaeothripinae causing galls on *Acacia* phyllodes. Head elongate, eyes large, cheeks usually narrowed to base; postocular setae small or absent; mouth cone short and rounded. Antennae eight-segmented, VII constricted at base, closely united with VIII; III with one sense cone, IV with three (or two) sense cones. Pronotal shield narrow, much longer than wide, epimeral sutures complete; major setae short and expanded, or absent (epimerals elongate in *augonsaxxos*); anteromarginal setae absent. Praepectus absent, sternal area of pronotum with large chitinous islets (7–10μ in diameter); mesopraesternum reduced or absent medially. Fore coxae and femora swollen; fore tibiae short and stout with a small apical tubercle on inner margin; fore tarsal tooth large, length of tooth including tarsal width greater than length of tibia. Mesonotal lateral seta expanded, metanotal median setae small. Fore wing pale with two expanded sub-basal setae and 15–20 duplicated cilia. Pelta elongate triangular, reticulate; tergites with reticulate sculpture particularly laterally, II–VII with two pairs of sigmoid wing-retaining setae, these setae sometimes reduced on VII. Tergite IX with B_1 and B_2 expanded, B_3 long and acute; tube shorter than head, sides evenly narrowed to apex, terminal setae dark. Sternites with about 20 accessory setae in two irregular transverse rows (one row in *augonsaxxos*); glandular area on sternite VIII of male present or absent. Intersegmental membranes of abdomen frequently grossly swollen in egg-laying females (Text-fig. 47).

The genus *Kladothrips* has never been formally defined but was published by Froggatt in a footnote to an article on Australian thrips. The brief notes in the footnote indicated that the antennae were seven-segmented, but after studying specimens collected by Froggatt, both Moulton (1927) and Bagnall (1929*b*) corrected this statement. Bagnall gave *Oncothrips* Karny as a synonym of *Kladothrips* although these genera are here kept separate. *Kladothrips froggatti* Bagn. is here regarded as a synonym of *rodwayi* Hardy, and *K. intermedius* Bagn. as a synonym of *tepperi* Karny, and these two species are placed in *Oncothrips*. The species *acallurus* and *differens* described by Bagnall in *Kladothrips* in 1932 are here regarded as synonyms of *tityrus* Girault and placed in the new genus *Katothrips*. The type specimens of *Cladothrips* [sic] *punctatus* Rayment, 1948 have been studied on loan from the Australian National Insect Collection, Canberra. This species is a member of the Megathripinae and is here regarded as a synonym of *Phaulothrips fuscus* Moulton, 1935, **syn. n.**

As a result of the above changes only four species are now accepted in *Kladothrips*, one of which is here described as new and one is removed from *Grypothrips*. Three of these species, and probably all four, are primary gall producers on the phyllodes of four different species of *Acacia* trees. The genus includes the most highly specialized Phlaeothripinae associated with such galls, but is very closely related

to *Onychothrips*. In particular *K. augonsaxxos* is intermediate between the two genera in such characters as the number of sense cones on the fourth antennal segment, the number of pronotal major setae, the shape of the head and probasisternal plates, and even the colour of the antennae. *Onychothrips* is distinguished by not having the pronotal shield unusually elongate, or in more general terms, in having a less elongate body but a more elongate tube. *Oncothrips*, although related, has no tubercle on the fore tibia and the males have a well developed glandular area on sternite eight.

In the British Museum (Natural History) collection there are five micropterous specimens collected by the author on *Acacia harpophylla*. These apparently represent a further species of *Kladothrips*, but as their most remarkable characters are undoubtedly correlated with microptery, the species cannot be defined adequately until macropterae become available.

KEY TO THE SPECIES OF *KLADOTHRIPS*

1 Probasisternal plates irregularly circular or pentagonal, almost as long as wide (Text-fig. 43); four pairs of major pronotal setae present; antennal IV with 2 sense cones; cheeks almost parallel; postocular setae present; antennal segments IV–VIII brown.
Maxillary stylets wide apart, not deeply retracted into head; on *Acacia doratoxylon* . . . . . ***augonsaxxos*** (p. 422)

– Probasisternal plates transverse, half as long as wide, median margins closely parallel (Text-fig. 41); pronotal anteroangular and midlateral setae absent; antennal IV with 3 sense cones; cheeks convex, narrowed to base; postocular setae present or absent; antennals IV and V yellow 2

2 Maxillary stylets in retracted position close together in middle of head, reaching midpoint of dorsal head length; postocular and pronotal posteromarginal setae absent (Text-fig. 48); antennal III less than 1·5 times as long as wide; on *Acacia pendula* . . . . . ***rugosus*** (p. 424)

– Maxillary stylets in retracted position wide apart near base of head, not retracted into head more than 1/3 of dorsal head length; postocular and pronotal posteroangular setae usually present; antennal III more than 1·8 times as long as wide . 3

3 Seta B_1 on tergite IX more than 0·3 times as long as tube; antennae elongate, IV without a sharply constricted basal neck, III 2·1 times as long as wide, IV 1·7 times as long as wide (Text-fig. 54); anterior abdominal segments black, antennals VII and VIII brown; male with glandular area on sternite VIII; on *Acacia harpophylla* ***acaciae*** (p. 421)

– Seta B_1 on tergite IX 0·25 as long as tube; antennal IV with sharply constricted basal neck; III 2·0 times as long as wide, IV 1·5 times as long as wide (Text-fig. 56); anterior abdominal segments yellow, antennals III–VII yellow, VIII yellowish brown; male without sternal gland; on *Acacia cambagei* . . . ***ellobus*** (p. 424)

Kladothrips acaciae (Moulton) **comb. n.**

(Text-fig. 54)

Grypothrips acaciae Moulton, 1968 : 109–110.

The genus *Grypothrips*, which Moulton apparently only knew through Karny's description, can be distinguished by means of the generic key given above. The present species is a typical *Kladothrips*, closely related to the type-species of the

genus, *rugosus*, and the new species described below. The male differs from both these species however in having an irregularly circular glandular area on sternite VIII which is about 35 microns in diameter.

Two specimens of *acaciae* were found in the Froggatt collection at Canberra bearing almost identical data to the holotype, and the author collected a single female with numerous larvae in a large bean-shaped phyllode gall on *Acacia harpophylla*. Similar galls on *harpophylla* have been collected at various times containing *Koptothrips zelos*, but the other species of *Koptothrips* are all known to be inquilines, not gall-producing species. In view of this it is probable that *acaciae* is the true gall-former on *harpophylla*, and *K. zelos* an inquiline. The galls in which these thrips have been taken are the largest thrips-induced galls from *Acacia* species. Up to two inches in length they are shaped like tubular bean- or pea-pods and the evaginated portion of the phyllode is usually reddish in colour.

Measurements (in microns) of male. Body length 3300. Head, length 400; width across eyes 200. Pronotal shield, length 500; median width 300; epimeral seta 50. Tergite IX, B_1 90; B_2 100; B_3 165. Tube, length 260; terminal setae 200. Antennal segments length, 50; 55; 95; 77; 70; 65; 62; 16.

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: Millmerran, on *Acacia harpophylla*, 3.ix.1928 (*J. MacQueen*), in California Academy of Sciences (Moulton No. 3068).

QUEENSLAND: Millmerran, 1 ♀, 1 ♂ in bean-leaf gall on Brigalow, *Acacia harpophylla*, 10.ix.1928 (*J. MacQueen*), in ANIC; Moonie, 1 ♀ with about 100 second instar larvae in bean-shaped phyllode gall on *Acacia harpophylla*, 16.vii.1968 (*L. A. Mound* 733), in BMNH.

Kladothrips augonsaxxos Moulton

(Text-figs 43 & 55)

Kladothrips augonsaxxos Moulton, 1927 : 153–155.

The host-plant of this species, *A. doratoxylon*, is reported to be most common in the Western Plains of New South Wales, although it has been recorded from as far west as Mount Olga in Central Australia. *A. doratoxylon* is classified in the Section of *Acacia* known as the Juliflorae which have the flower heads elongate, not globular as in typical *Mimosa* blossoms. It is interesting that the host-plant of *Onychothrips*, *A. aneura*, is also placed in the Juliflorae although the host-plants of the other three *Kladothrips* species are placed in the Section Plurinerves. As noted above *K. augonsaxxos* is closely related to the species of *Onychothrips*.

♀ colour brown; antennal III, metathorax and pelta, fore tibia and tarsus and extreme apex of fore femur yellowish. With the morphological characters given in the generic definition and key to species above.

Measurements (in microns) of one female from type host and locality. Body length (abdominal intersegmental membranes hypertrophied) 4400. Head length 350; median width 160; postocular seta 32. Pronotal shield, length 360; median width 280; epimeral seta 95. Tergite IX, B_1 70; B_2 80; B_3 120. Tube, length 240; terminal setae 150. Antennal segments length, 50; 65; 77; 70; 70; 58; 65; 16.

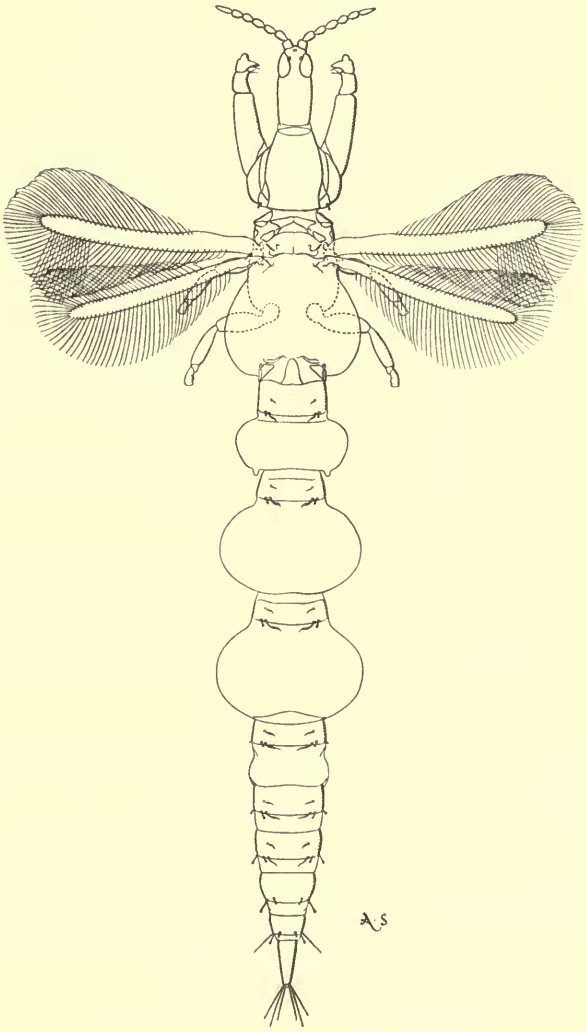


FIG. 47. *Kladothrips rugosus*, female in egg laying condition.

MATERIAL STUDIED. Holotype ♀. NEW SOUTH WALES: Gilgandra, in spherical gall on *Acacia doratoxylon*, 13.x.1925 (*W. W. Froggatt*), in California Academy of Sciences (Moulton No. 1347).

Paratype ♀ bearing same data as holotype in BMNH.

NEW SOUTH WALES: Gilgandra, 8 ♀ in galls on *A. doratoxylon*, 1926 (*G. Withers*); Griffith, 2 ♀ in *Acacia* galls, 8.xii.1959 (*E. L. Jones*), in ANIC.

***Kladothrips ellobus* sp. n.**

(Text-figs 41 & 56)

♀ bicoloured yellow and brown; brown on head and antennal I, pronotum, fore femora, abdominal segments VII–X and median areas of III–VI; yellow antennae, pterothorax and legs, and anterior abdominal segments, fore tibiae and tarsi largely yellow but with shaded margins (the brown areas probably increase in density and extent with age even after an individual has reached sexual maturity). With the morphological characters given in the generic definition and key to species above.

Measurements (in microns) of holotype. Body length 2800. Head, length 300; width across eyes 170; postocular seta 23. Pronotal shield, length 330; median width 260; epimeral seta 32. Fore wing, length 950; number of duplicated cilia ?15. Tergite IX, B_1 38; B_2 55; B_3 100. Tube, length 195; terminal setae 160. Antennal segments length, ?30; 55; 65; 55; 50; 50; 55; 16.

♂ colour and structure similar to ♀; sternite VIII without a glandular area; left postocular seta not developed in allotype.

Measurements (in microns) of allotype: Body length 2900. Head, length 220; width across eyes 170. Pronotal shield, length 370; median width 270; epimeral seta 35. Tergite IX, B_1 45; B_2 52; B_3 100. Tube, length 190; terminal setae 145.

MATERIAL STUDIED. Holotype ♀. SOUTH AUSTRALIA: East of Dalhousie Springs (approximately 80 miles north of Oodnadatta), in gall on *Acacia cambagei* by a creek, 12.ii.1965 (*L. A. Mound* 301, taken from an herbarium specimen at Waite Institute, Adelaide, collected by *D. E. Symmons* 3263), in ANIC.

Paratype ♀ taken in similar gall to holotype on the same herbarium specimen, in BMNH.

Allotype ♂ and 3 ♀. QUEENSLAND: 20 miles north of Durham Downs (30 miles south east of Lake Yamma Yamma), in galls on *Acacia cambagei*, 13.ii.1968 (*R. Lewis*), in BMNH.

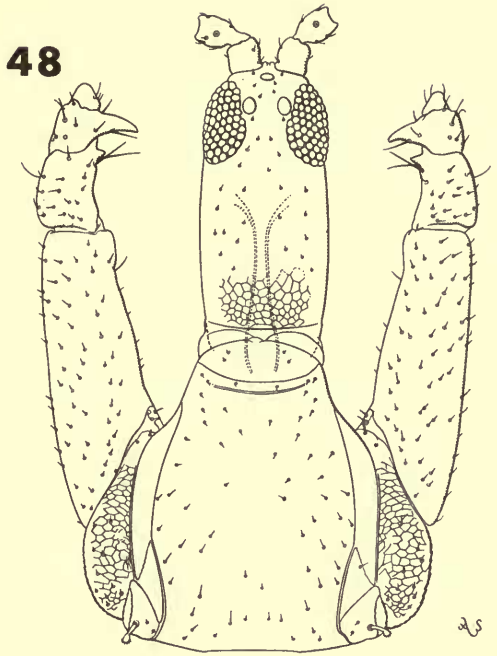
The phyllode galls from which these specimens were taken looked like flat kidney-shaped pods, and the specific epithet *ellobus* is derived from the fact that the specimens were found 'in a pod'. These 'pods' were about 2 cm in diameter and 3 mm thick, and could be mistaken quite readily for the true pods of the *Acacia* tree.

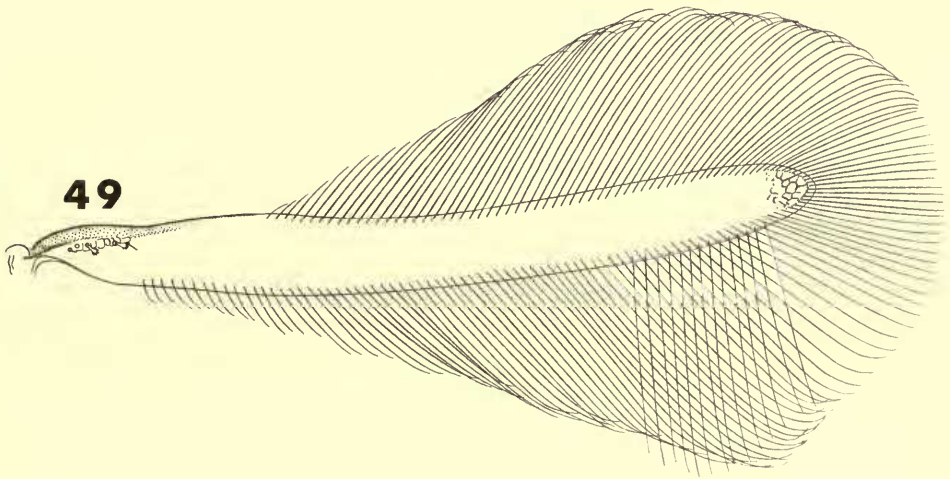
***Kladothrips rugosus* Froggatt**

(Text-figs 44, 47–49 & 57)

Kladothrips rugosus Froggatt, 1906 : 1011.
Kladothrips rugosus Froggatt; Bagnall, 1929*b* : 194–195.

The maxillary stylets of *rugosus* are deeply retracted into the head as in the two species of *Onychothrips* but unlike the other species of *Kladothrips*. However, in





FIGS 48–49. *Kladothrips rugosus*: 48, head, pronotum and fore leg of female. 49, fore wing.

the extreme reduction of the major setae and the very pale antennae *rugosus* appears to be the most highly evolved of the *Kladothrips* group. The abdominal intersegmental membranes of many females of this species are greatly hypertrophied as Froggatt (1927 : 87) has figured for *augonsaxxos* (Text-fig. 47).

The galls formed by *rugosus* on *A. pendula* are flask-shaped when fully developed, distinctly wider at the base than at the point of evagination from the phyllode, about 2 cm deep and 1·5 cm wide. In many galls there was a tendancy for the eggs to be laid near or in the apex of the 'flask' close to the mouth of the gall. Also dead adults were observed frequently squashed between the opposing surfaces of the mouth of the gall. It is possible that galls develop more slowly on *pendula* than on other species of *Acacia*, and this allows adults to enter and leave the developing evagination. Most of the young galls of this species which were examined contained both male and female thrips.

Froggatt refers to, and illustrates, heavily rugose galls in the original description of *rugosus*. Such galls were occasionally seen by the present author on *A. pendula* but they are apparently aberrant, the surface being attacked by some unidentified insect. Normal healthy galls caused by *rugosus* are quite smooth with the typical glaucous green of their host plant.

The female here selected as LECTOTYPE was found dry on a card in Froggatt's collection at Canberra. It appears to have come from the original collection on which the species was based as it was labelled in Froggatt's handwriting and was accompanied by the dry rugose galls shown in the original figure.

♀ bicoloured brown and yellow; brown on head and antennal I, prothorax, fore femur, anterior and lateral margins of pterothorax, mid and hind legs, and abdominal segments II–X; yellow on pelta, pterothorax, fore tarsi, fore tibiae and apex of fore femora, antennals II–VIII (Bagnall's description refers to the less mature specimens which are coloured as in *ellobus* above). With the morphological characters given in the generic definition and key to species above.

Measurements (in microns) of lectotype: Body length 2700. Head, length 310; width across eyes 150. Pronotal shield, length 330; median width 260; epimeral seta 30. Fore wing, length ?1000; number of duplicated cilia ?15. Tergite IX, B_1 45; B_2 58; B_3 100. Tube, length 190; terminal setae ?195. Antennal segments, length 35; 55; 52; 52; 50; 50; 55; 16.

♂ colour similar to female except pterothorax darker, little paler than prothorax.

Measurements (in microns) of one male. Body, length 2400. Head, length 280; width across eyes 130. Pronotal shield, length 270; median width 200; epimeral seta 28. Fore wing, length 800; maximum width 60; number of duplicated cilia 11. Tergite IX, B_1 32; B_2 45; B_3 80. Tube, length 160; terminal setae 150. Antennal segments length, 32; 42; 42; 42; 42; 42; 50; 16.

MATERIAL STUDIED: LECTOTYPE ♀. NEW SOUTH WALES: Tamworth, in rugose gall on *Acacia* sp., 15.ii.1904 (*W. W. Froggatt*), in ANIC.

NEW SOUTH WALES: Yenda, 7 ♀, 3 ♂ in *Acacia pendula* galls, 9.ii.1927 (*McKewan*); Leeton, 4 ♀, 5 ♂, (*McKewan*), in ANIC; 19 miles south of Forbes, 3 ♀, 1 ♂ in *Acacia pendula* galls, 7.iii.1968 (*L. A. Mound* 528); 10 miles south of Parkes, 4 ♀, 3 ♂, in *A. pendula* galls, 8.iii.1968 (*L. A. Mound* 547); Trangie, 19 ♀, 14 ♂, in *A. pendula* galls, 7.iii.1968 (*L. A. Mound* 559); 10 miles south of Collie, 8 ♀, 7 ♂, in *A. pendula* galls, 7.iii.1968 (*L. A. Mound* 560); 11 miles north east of Walgett, 1 ♀ in *A. pendula* gall, 5.vi.1968 (*L. A. Mound* 662), in BMNH.

KOPTOTHRIPS Bagnall

Koptothrips Bagnall, 1929*b* : 197. Type-species: *K. flavicornis*, by monotypy.
Sphaericothrips Moulton, 1968 : 115. Type-species: *Sphaerothrips* [sic] *clarapennis*, by monotypy. **Syn. n.**

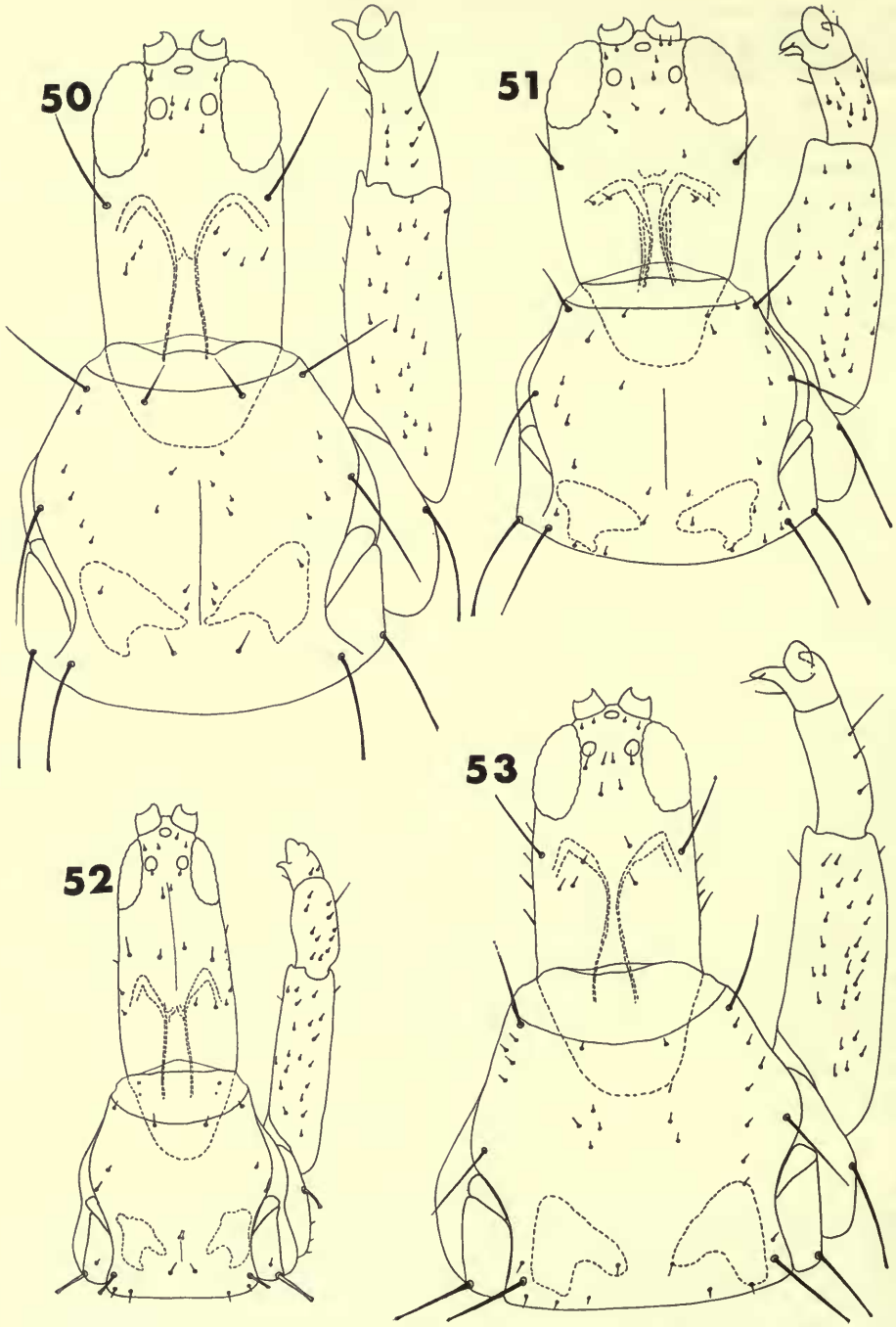
Small to medium-sized, brown or bicoloured macropterous Phlaeothripinae, living as inquilines in thrips galls on *Acacia* phyllodes. Body with very little sculpture, pronotum smooth and polished in life. Head longer than wide; maxillary stylets retracted to postocular setae, maxillary bridge in middle of head; mouth cone short and rounded. Antennae eight-segmented, VII and VIII not closely united; III with one sense cone, IV with three sense cones. Pronotal shield broad, in large specimens a little longer than broad, epimeral sutures frequently not complete; anteromarginal setae usually not elongate; major setae slender, usually acute or rounded at apex. Praepectus absent, chitinous islets of prosternum very large; probasisternal plates with stout posterior margin; mesopraesternum very reduced, usually fused with anterior border of mesosternum. Mesonotal lateral setae well developed; metanotal median setae slender, usually long. Fore femur stout, fore tibia with an apical tubercle in one species; fore tarsus with a stout tooth and well developed ventrolateral hamus. Fore wing parallel-sided, with about 10–20 duplicated cilia; three sub-basal setae. Pelta broadly triangular; tergites II–VII with two pairs of wing-retaining setae; tergal posteroangular setae usually about as long as marginal B_1; tube slender, shorter than head, terminal setae shorter than tube. Sternites with a transverse row of accessory setae less than half as long as sternal marginals; male without glandular area on sternite VIII but with B_2 on tergite IX rather shorter than B_1.

The species *clarapennis*, for which Moulton erected the genus *Sphaericothrips*, is regarded here as a synonym of *flavicornis* Bagnall, the type-species of *Koptothrips*. Since the species of this genus live as inquilines in galls induced by *Kladothrips*, *Onychothrips* and *Oncothrips* species, it is reasonable to assume that *Koptothrips* and its species have evolved more recently than the gall-formers. Morphologically *Koptothrips* seems to be quite distant from other members of the Kladothripina. The fact that the apical suture of antennal segment seven is transverse, not oblique, so that segments seven and eight are quite separate indicates that this genus is on a distinct evolutionary line. Moreover, long slender major setae and incomplete epimeral sutures are not found elsewhere in the Kladothripina. However the antennal sense cone formula, the well developed fore tarsal tooth and the absence of the praepectal plates suggests that *Koptothrips* has been derived from similar ancestors as the other Kladothripina, i.e. a leaf-feeding, probably leaf-rolling, species of the *Teuchothrips* complex. The most closely related genus is possibly *Thaumatothrips* which lives in galls on *Casuarina cristata* twigs, but this has a series of tubercles on the fore femur. In the opinion of the present author *Koptothrips* does not belong in the Plectrothripini where Moulton placed *Sphaericothrips*.

Key to the Species of *Koptothrips*

1 Lateral margins of eyes converging to anterior (Text-fig. 52); antennae short, segment III as wide as long (Text-fig. 58), or up to 1·15 times as long as wide in large individuals; B_1 on tergite IX expanded at apex, less than half as long as tube; on *A. oswaldi*, *pendula*, and ?*melanoxylon* . . . . . ***flavicornis*** (p. 429)

– Eyes normally rounded (Text-figs 50–51); antennal III usually more than 1·5 times as long as wide, in very small individuals 1·25 times as long as wide; B_1 on tergite IX at least two-thirds as long as tube 2



FIGS 50–53. Head, pronotum and fore leg of *Koptothrips* species: 50, *zelus*. 51, *xenus*. 52, *flavicornis*. 53, *dyskritus*.

2 Inner margin of fore tarsus with basal tubercle as well as apical tooth (Text-fig. 51); median metanotal setae less than half as long as the distance between their bases; on *Acacia cambagei* . . . . . ***xenus*** (p. 433)

– Fore tarsus without a basal tubercle; median metanotal setae more than two-thirds as long as the distance between their bases 3

3 Inner apex of fore tibia with a tubercle (Text-fig. 50); antennals VI & VII with straight sides, VI more than 1·9 times as long as wide except in very small individuals (Text-fig. 60); on *Acacia harpophylla* . . . . . ***zelus*** (p. 433)

– Fore tibia without a tubercle (Text-fig. 53); antennals VI & VII with convex sides, VI less than 1·75 times as long as wide (Text-fig. 61); on *A. pendula, aneura, & oswaldi* ***dyskritus*** (p. 430)

Koptothrips flavicornis Bagnall

(Text-figs 52, 58 & 62)

Koptothrips flavicornis Bagnall, 1929*b* : 197–198.
Koptothrips flavicornis Bagnall; Mound, 1968 : 130.
Sphaerothrips [sic] *clarapennis* Moulton, 1968 : 116–117. **Syn. n.**

Bagnall described this species as having the head increasing in width to the base, and it is interesting to note that Moulton described *clarapennis* in similar terms. However both these authors were studying single specimens which had been crushed in mounting. Recently collected specimens which have been mounted on to slides with insufficient balsam have their heads broad at the base, but specimens from the same series mounted correctly show that the head is slightly narrower at the base than medially (Text-fig. 52). The artificial condition described by both Bagnall and Moulton is readily produced by crushing because the head of this species is very deep, almost oval in cross section near the base. The postocular setae are acute, not expanded as Moulton figures.

The variation of this species is difficult to interpret because the available material is derived from a few restricted localities. The differences in colour and setal lengths may be due to relative isolation and inbreeding of each population, or these differences may indicate that the forms on *A. pendula* are specifically distinct from the forms on *A. oswaldi*. In the latter case both these forms might then be distinct from the nominal form which was collected in an area where *melanoxylon* is the dominant *Acacia* species. All the specimens from galls on *oswaldi* at Peak Hill, N.S.W. have postocular setae about 30μ long, the anterior part of the body is yellow, and B_2 on the ninth abdominal tergite is about 100μ, i.e. half as long as the tube. On the other hand specimens from galls on *pendula* near Forbes, N.S.W., have postocular setae about 16μ long, the body is all brown, and B_2 on tergite nine is about 65μ, i.e. just over one-third as long as the tube. The colour differences are almost certainly due to different degrees of maturity, but the differences in setal lengths suggests the presence of host-specific forms. A similar problem occurs in the new species *dyskritus* described below, which apparently lives on three different host species and shows variation in the setae behind the eyes and on tergite nine.

♀ macropterous. Colour brown with yellow-brown fore tibiae, fore tarsi, and antennals III–VIII; many specimens have pronotum, fore legs, and most of head yellow, and dorsal surface of pterothorax yellow-brown; fore wings clear, cilia dark; major setae pale.

With the morphological characters given in the generic definition and key to species above. Head devoid of sculpture except at extreme base. Pronotal epimeral sutures complete or incomplete, even on one individual; anteromarginal setae about 10μ, anteroangular setae about 20μ, midlateral setae about 30μ, all acute at apex; posteroangular and epimeral setae expanded at apex, 50–60μ; prosternal chitinous islets up to 5μ in diameter. Metanotum faintly reticulate anterolaterally. Fore wing sub-basal setae B_1 and B_2 expanded, B_3 longer and acute.

Measurements (in microns) of one ♀ from Peak Hill with one ♀ from Forbes in parentheses. Body length 2250 (2200). Head, length 280 (280); median width 145 (130); postocular seta 26 (16). Pronotal shield, length 200 (195); median width 240 (210); epimeral seta 58 (32). Mesonotal lateral seta 35 (22). Metanotal median seta 65 (50). Fore wing, length 850 (800); distal width 70 (65); sub-basal setae 42, 45, 100 (28, 28, 80); number of duplicated cilia 10–12. Tergite IX, B_1 58 (50); B_2 80 (65); B_3 85 (65). Tube, length 150 (160); basal width 65 (65); terminal setae 115 (130). Antennal segments length, 26; 39; 32; 35; 32; 32; 32; 19.

♂ macropterous. Colour and structure very similar to female, body length rather smaller, about 1800μ. Tergite IX setae B_1 and B_2 of one ♂ from Peak Hill 74μ and 53μ; of one ♂ from Forbes 48μ and 50μ.

MATERIAL STUDIED. Holotype ♂. VICTORIA: Gippsland, on *Acacia* sp. (*C. French*), in BMNH.

Holotype ♀ of *clarapennis*. NEW SOUTH WALES: Yenda, Leeton, on Boree [*A. pendula*], 8.ii.1927 (*W. W. Froggatt*), in California Academy of Sciences (Moulton No. 1706).

NEW SOUTH WALES: Peak Hill, 12 ♀, 2 ♂ in small poorly developed galls containing dead *Oncothrips tepperi* on *Acacia oswaldi* phyllodes, 8.iii.1968 (*L. A. Mound* 569); 19 miles south of Forbes, 5 ♀, 1 ♂ in galls on *A. pendula*, 6.vi.1968 (*L. A. Mound* 677); Trangie, 2 ♀ in galls on *A. pendula* containing dead *Kladothrips rugosus* and live caterpillars, 7.iii.1968 (*L. A. Mound* 555–556); 23 miles south of Gilgandra, 9 ♀, 2 ♂ in small flat gall on *A. pendula*, 6.vi.1968 (*L. A. Mound* 674), in BMNH; Ungarie, 2 ♀, 1 ♂ in galls on Milgee [*A. oswaldi*] or Rosewood, 5.ix.1926, in ANIC. SOUTH AUSTRALIA: Loxton, 1 ♀ in gall on *A. oswaldi*, 30.x.1967 (*L. A. Mound* 393), in BMNH. QUEENSLAND: 16 miles south east of Eulo, 1 ♀ on *A. oswaldi*, 23.x.1948, in ANIC.

Koptothrips dyskritus sp. n.

(Text-figs 53 & 61)

♀ macropterous. Colour dark brown, fore tarsi, fore tibiae and apices of fore femora yellow with brown shadings; antennals III–VIII yellow with brown area dorsally in distal half, VII and VIII sometimes brownish yellow; fore wings pale, cilia dark; major setae pale, terminal setae of tube dark at base.

With the morphological characters given above in the generic definition and key to species. Head without sculpture; postocular setae acute, almost as long as eye (Text-fig. 53). Pronotal anteroangular, midlateral and posteroangular setae acute, longer than postoculars, epimeral setae shorter with apex rounded or weakly expanded. Epimeral sutures complete; mesopraesternal plates not fused to mesosternum. Mesonotal midlateral setae expanded, metanotal median setae long and acute. Fore wing sub-basal seta B_3 long and acute. Tergite IX B_1 and B_2 weakly expanded.

♂ macropterous. Colour and structure very similar to ♀; B_2 on tergite IX shorter than B_1.

This description is based on a long series of remarkably uniform individuals taken from a single gall on *A. pendula*. A series collected from a gall on *A. aneura* shows a number of differences; the antennae are more uniformly yellow-brown, without the dark area on III and IV, and increasingly dark toward the apical segments; the postocular setae and the pronotal anteroangular, midlateral and posteroangular setae are not acute but softly rounded at the apex; B_1 and B_2 on tergite nine are softly rounded, i.e., less expanded than in the *pendula* series. Moreover, specimens collected from galls on *A. oswaldi* have the postocular setae acute and about half as long as the eye but the pronotal setae as in the *aneura* series; B_1 and B_2 on tergite nine weakly expanded as in the *pendula* series; antennal segments III–VII with a brown area distally at least on the dorsal surface.

It is not possible on the available series to decide if these forms are truly host-specific species or sub-species, or if the observed differences are merely the result of normal inter-gall variation. A few specimens are available from other localities and these indicate that the form of the apices of the pronotal major setae and the length of the postocular setae are not constant on *A. pendula*. Because of these specimens the author inclines to the view that *dyskritus* is a variable and polyphagous species, although further collecting may result in a different opinion. The smallest female of *dyskritus* (body length 2300) which has been studied is very similar to the largest available specimen of *flavicornis*.

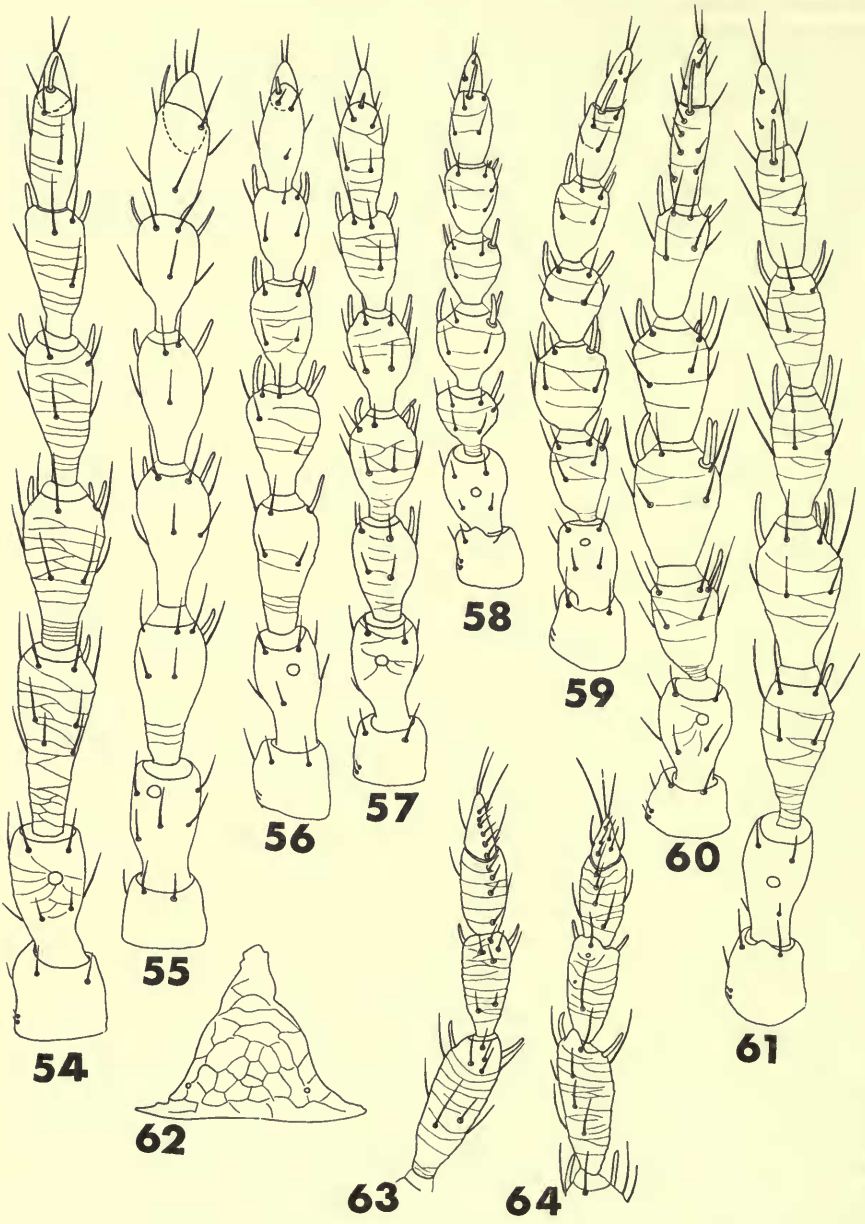
Measurements (in microns) of holotype ♀ with allotype ♂ in parentheses. Body length 3650 (3150). Head, length 370 (320); median width 240 (225); postocular seta 100 (80). Pronotal shield, length 370 (320); median width 480 (450); anteroangular seta 140 (120); epimeral seta 140 (130); posteroangular seta 200 (175). Mesonotal midlateral seta 85. Metanotal median seta 190. Fore wing, length 1400 (1200); distal width 100 (95); sub-basal setae 95; 155; 210; number of duplicated wing cilia 20 (16). Tergite IX, B_1 185 (160); B_2 177 (95); B_3 177 (167). Tube, length 225 (210); terminal setae 240 (260). Antennal segments length, 32; 65; 68; 77; 65; 58; 63; 48 (32; 58; 68; 74; 65; 58; 65; 42).

MATERIAL STUDIED. Holotype ♀. NEW SOUTH WALES: 19 miles south of Forbes, in gall on *Acacia pendula*, 8.iii.1968 (*L. A. Mound* 538), in ANIC.

Allotype ♂ with 77 ♀, 3 ♂ paratypes in same gall as holotype.

NEW SOUTH WALES: 10 miles south of Parkes, 7 ♀, 2 ♂ in galls on *A. pendula*, 8.iii.1968 (*L. A. Mound* 540 & 541); Trangie, 1 ♀ in gall on *A. pendula*, 7.iii.1968 (*L. A. Mound* 558); Peak Hill, 6 ♀, 2 ♂ in galls on *A. oswaldi*, 8.iii.1968 (*L. A. Mound* 566), in BMNH; Leeton, 3 ♀, 1 ♂ in galls on *A. pendula*, 1927 (*K. McKewan*), in ANIC. SOUTH AUSTRALIA: Loxton, 10 ♀, 19 ♂ & 3 ♀, 1 ♂ in two galls on *A. oswaldi*, 7.iii.1968 (*R. Brewer*), in BMNH. NORTHERN TERRITORIES: Ayers Rock, 23 ♀, 1 ♂ in spherical gall on *A. aneura*, 24.x.1967 (*L. A. Mound* 289 s7), in BMNH; Alice Springs, 2 ♀ on *A. aneura*, 25.vi.1957 (*C. E. Chadwick*), in ANIC.

This species enters and breeds in the galls of other thrips species only after such galls have been attacked by a lepidopterous caterpillar. The galls from Peak Hill and Loxton on *A. oswaldi* were attacked by two different species of Cosmopterygidae (det. I. Common), and *K. dyskritus* was only found in galls containing frass and dead primary gall-forming thrips.



FIGS 54–64. 54–57. Antenna of *Kladothrips* species: 54, *acaciae*. 55, *augonsaxxos*. 56, *ellobus*. 57, *rugosus*. 58–61. Antenna of *Koptothrips* species: 58, *flavicornis*. 59, *xenus*. 60, *zelus*. 61, *dyskritus*. 62. Pelta of *Koptothrips flavicornis*. 63–64. *Kellyia* species, distal antennal segments: 63, *hoodianus*. 64, *biadenes*.

Koptothrips xenus sp. n.

(Text-figs 51 & 59)

♀ macropterous. Colour brown, increasingly dark toward posterior; head light brown; mid and hind legs dark brown, fore femora golden, fore tibia, fore tarsi and antennae yellow; fore wings pale with dark cilia; major setae pale, except dark terminal setae.

With the characters given above in the generic definition and key to species. Anterior margin of head transverse, antennal insertions barely ventral (Text-fig. 51); postocular setae about half as long as eye. Pronotal setae blunt or expanded at apex; epimeral sutures incomplete; fore tarsus with a distinct tubercle at base just above insertion into tibia. Mesopraesternal plates almost fused to anterior margin of mesosternum. Median metanotal setae short. Anterior margin of pelta transverse. Tergite IX with B_1 and B_2 softly rounded at apex.

♂ macropterous. The only available male is in fragments, but the fore tarsus is similar to that of the female.

Measurements (in microns) of holotype ♀. Body length 2800. Head, length 290; median width 230; postocular seta 55. Pronotal shield, length 290; median width 310; anteroangular seta 70; posteroangular seta 115. Metanotal median seta 32. Fore wing, length 1000; distal width 95; sub-basal setae 65, 65, 65; number of duplicated cilia 16. Tergite IX, B_1 130; B_2 135; B_3 115. Tube, length 190; terminal setae 175. Antennal segments length, 32; 45; 50; 50; 39; 39; 44; 36.

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: 20 miles north of Durham Downs (30 miles south east of Lake Yamma Yamma), in *Kladothrips ellobus* gall on *A. cambagei*, 13.ii.1968 (*R. Lewis*), in ANIC.

Allotype ♂ and 4 ♀ were taken with the holotype.

Koptothrips zelus sp. n.

(Text-figs 50 & 60)

♀ macropterous. Colour dark brown, fore tibiae and tarsi and apex of fore femora yellow; antennals III–VI and apex of II yellowish, VII, VIII and apex of V and VI light brown; fore wings clear, cilia dark; major setae pale except terminal setae of tube.

Postocular setae slender, almost as long as eye; antennal segments angular in profile. Pronotal anteromarginal setae well developed, two-thirds as long as anteroangulars; epimeral sutures not complete; fore tibia with apical tubercle on inner margin extending into flange around ventral surface of tibial apex (Text-fig. 50). Tergite IX B_1 and B_2 with broadly rounded apices.

♂ macropterous. Colour and structure similar to female but smaller; B_2 on tergite IX shorter than B_1.

Measurements (in microns) of holotype ♀ with allotype ♂ in parentheses. Body length 3600 (2400). Head, length 385 (275); median width 240 (205); postocular seta 125 (100). Pronotal shield, length 425 (275); median width 420 (340); posteroangular seta 175 (135). Mesonotal midlateral seta 80 (70). Metanotal median seta 160 (100). Fore wing, length 1450; distal width 115; sub-basal setae 115, 145, 225; number of duplicated cilia 21. Tergite IX, B_1 225 (140); B_2 195 (90); B_3 195 (140). Tube, length 275 (145); terminal setae 245 (140). Antennal segments length, 32; 52; 55; 62; 58; 65; 58; 35 (32; 45; 42; 42; 39; 42; 39; 23).

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: 50 miles south west of Dalby, in bean-shaped phyllode gall on *Acacia harpophylla*, 16.vii.1968 (*L. A. Mound* 775), in ANIC.

Allotype ♂ and 5 ♀ paratypes, taken in same gall as holotype with numerous larvae.

QUEENSLAND: 50 miles SW of Dalby, 15 ♀ in phyllode gall on *A. harpophylla*, 16.vii.1968 (*L. A. Mound* 776); Moonie, 57 ♀ in phyllode gall on *A. harpophylla*, 16.vii.1968 (*L. A. Mound* 732), in BMNH; Millmerran, 38 ♀, 4 ♂ in bean-shaped galls on Brigalow, 8, 10, 16. viii.1928, & 3, 10. ix. 1928 (*J. McQueen*), in ANIC.

The observed variation in body size of this species is small but this is probably due to the few samples which are available. However one female out of a gall containing about one hundred females and no males taken at Moonie was much smaller than all the other specimens, the body length being 2500μ. The antennae of this female are shorter and the segments more rounded than normal, similar to the antennae of *xenus* but with a longer sixth segment.

K. zelus is discussed above under *Kladothrips acaciae*. The large bean-shaped galls in which *zelus* was collected by the author were apparently healthy, and in the field this species was assumed to be the primary gall producer. However, because three species of *Kladothrips* are known to be gall-producers and three species of *Koptothrips* are known to be inquilines, it is reasonable to assume that *zelus* is an inquiline in the galls of *acaciae*. *Koptothrips flavicornis* enters galls of *Oncothrips tepperi* on *Acacia oswaldi* which have been attacked by caterpillars, and field observations suggest that *flavicornis* is unable to stimulate continued growth of such galls. In view of the healthy condition of the galls in which *zelus* was taken it is possible that this species of *Koptothrips* can stimulate the continued growth of galls on *A. harpophylla*.

LICHANOTHRIPS gen. n.

Type-species: *Lichanothrips albus* sp. n.

Large macropterous species of Phlaeothripinae. Head projecting slightly in front of eyes; cheeks weakly incut behind eyes, constricted at base, sometimes with several pairs of pale setae; eyes larger on dorsal than on ventral surface; ocelli not directed forwards; posterior margin of head with median cleft; mouth cone very short and rounded; maxillary stylets wide apart, very low in head. Antennae eight-segmented, I longer than II, VIII less than half as long as VII; one sense cone on III, three sense cones on IV. Pronotal shield flat with stout median apodeme, epimeral sutures complete; major setae weakly developed, epimeral setae short and stout; praepectus small, mesopraesternum reduced to two triangular plates, probasisternum large; fore tarsal tooth longer than tarsal width in both sexes. Fore wings very broad, duplicated cilia present, apical cilia short; sub-basal setae short, arranged in a triangle. Mesonotal furrow less than one-third of median length, midlateral setae not developed. Metanotal median setae small; median area of metanotum between setae weakly reticulate. Pelta rectangular; tergites with a median longitudinal ridge anterior to deeply concave antecostal ridge; lateral margins of tergite II with several short stout setae; tube shorter than head, terminal setae and major setae on tergite IX shorter than tube with acute apices. Sternite VIII of ♂ with or without glandular area; sternal accessory setae very small, several additional accessory setae present anterior to the usual transverse row; sternal marginal B_2 and B_3 of females frequently thorn-like; male genitalia with navicula drawn out into a sharp point.

This new genus is readily distinguished from the rest of the Phlaeothripinae by the position of the maxillary stylets. The only species in which the stylets do not extend into the head for most of their length are small forms living in leaf-litter which are related to *Sophiothrips* (see Mound, 1970*a*), the grass-living genus *Antillo-*

thrips and the Australian species *Panoplothrips australiensis* Moulton, 1968. *Lichanothrips* and *Panoplothrips* have similar heads, meso- and metanota, and short major setae, but the latter genus is distinguished by the absence of fore wing duplicated cilia, the large tubercle on the fore femur, the single pair of wing-retaining setae on tergite eight, and the presence of only two sense cones on antennal segment four. *Grypothrips* is probably related, particularly as *G. clavisetae* has a pair of stout cheek setae, and *L. semifuscipennis* has a small *Grypothrips*-like probasisternum. However the fore wings of *Lichanothrips* species are exceptionally broad distally, and in *Grypothrips* the maxillary stylets are parallel to each other low in the head, and the navicula of the male genitalia has a rounded apex.

Paracholeothrips Moulton, 1968 has a similar head shape but the stylets are close together in the middle of the head. Moreover in this genus the mesonotum is divided longitudinally, there are two sense cones on the third antennal segment, and the fore wings apparently lack duplicated cilia. *Lichanothrips* and *Panoplothrips* may have to be placed in a separate tribe, although they are related to *Grypothrips* and even *Akainothrips*. The *Csirothrips* group of genera may also be derived from related ancestors, which also gave rise to the Kladothripina. None of these genera can be related on present knowledge to forms from outside Australia. The new generic name is derived from the Greek *lichanos*—fore finger, in reference to the fore tarsal tooth.

Key to the Species of *Lichanothrips*

1 Body white, cuticle without pigment except on antennals III–VIII and terminal setae of tube; postocular setae very small (Text-fig. 67); tergite wing-retaining setae reduced, anterior pair usually absent, posterior pair short and straight; ♂ without glandular area on sternite VIII . . . . . ***albus*** (p. 437)

– Body brown, legs sometimes yellow; postocular setae well developed; two pairs of sigmoid wing-retaining setae on tergites II–V, these setae usually reduced on VI–VII; ♂ with glandular area on sternite VIII in *pulchra & shakespearella* . . 2

2 Head elongate, more than twice as long as width at postocular setae (Text-fig. 66), about 1·25 times as long as pronotum in ♀; fore tarsal tooth very long and slender, distinct from apex of tibia; posteroangular seta of sternites V–VIII short and stout, on tubercles which are longer than the setae (Text-fig. 90) ***magnificus*** (p. 437)

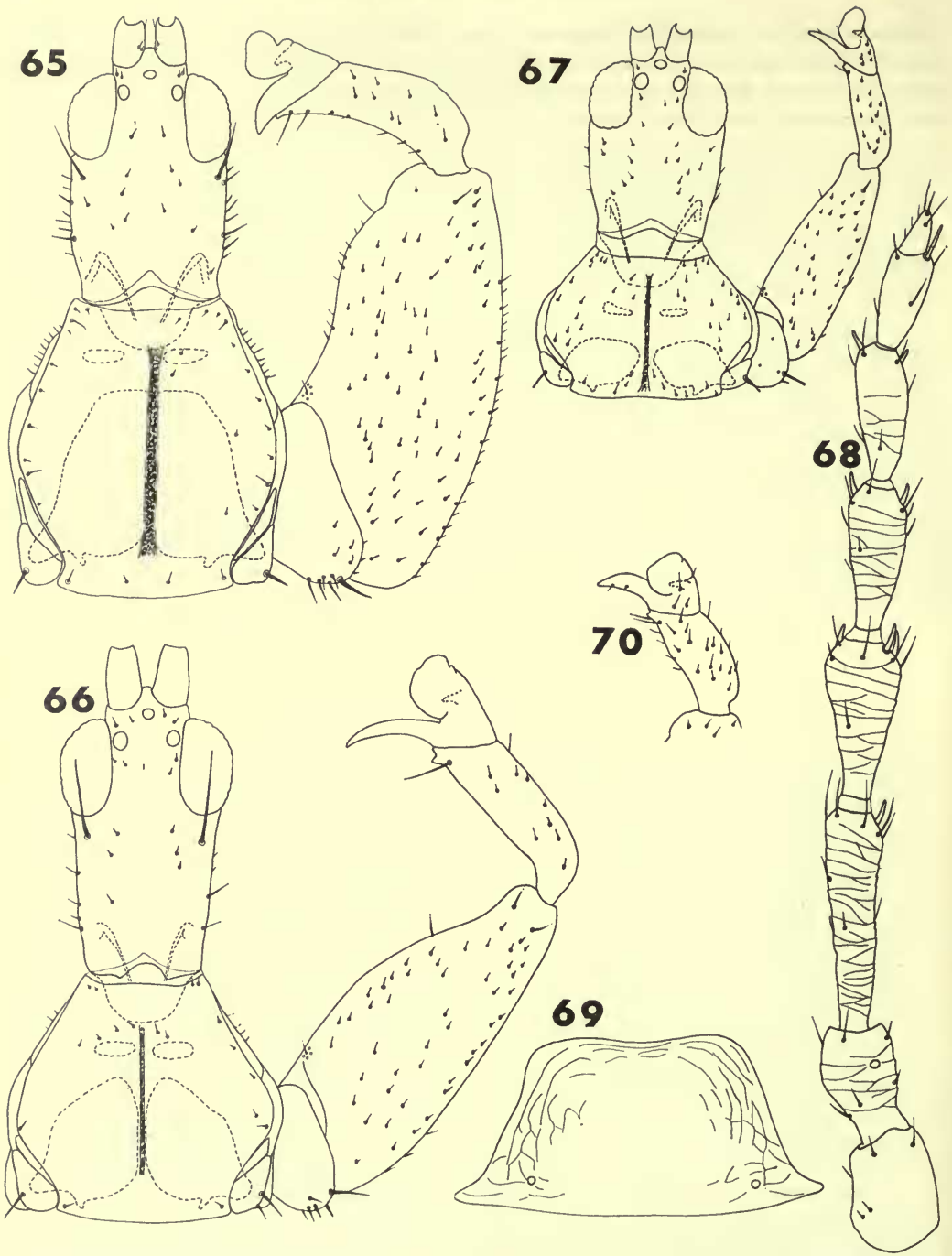
– Head less than 1·8 times as long as median width, in ♀ shorter than pronotum or about as long; fore tarsal tooth stout, close to drawn out apex of tibia; posteroangular setae of sternite shorter than the small papillae on which they arise . . . 3

3 Probasisternal plates wider than long; lateral margins of abdominal segments III–V without large median tubercles; fustis in abdominal segment IX of ♀ broad and plate-like as in *Grypothrips* . . . . . ***semifuscipennis*** (p. 438)

– Probasisternal plates elongate, median margins clearly parallel, occupying most of prosternum; lateral margins of abdominal segments III–V with a pair of large tubercles; fustis in abdominal segment IX of ♀ rod-like 4

4 Head with cheeks distinctly convex; head of ♀ less than 1·65 times as long as wide (Text-fig. 65) . . . . . ***pulchra*** (p. 438)

– Head with cheeks concave; head longer, in ♀ 1·75 times as long as wide ***shakespearella*** (p. 439)



FIGS 65–70. *Lichanothrips* species. 65–67. Head, pronotum and fore leg: 65, *pulchra* large female. 66, *magnificus*, holotype female. 67, *albus*, female. 68. Antenna of *albus*. 69. Pelta of *albus*. 70. Fore tibia and tarsus of *semifuscipennis*.

Lichanothrips albus sp. n.

(Text-figs 67–69)

♀ macropterous. Colour white, some specimens shaded pale brown between the eyes; red pigment in eyes and ocelli; antennal VIII and apices of III–VII brown; wings pale, cilia yellowish; major setae pale except dark brown terminal setae on tube.

With the characters given in the generic definition and key to species. Surface of head with faint transverse striations, with indistinct sculpture only at base; cheek setae present in some individuals (Text-fig. 67). Antennal III with furrow on inner margin (Text-fig. 68); sense cones short and broad. Pronotal major setae not distinct from microsetae, except for epimerals. Probasisternum wider than long. Fore femur not enlarged; fore tibia simple; fore tarsal tooth very long and slender (Text-fig. 67). All three sub-basal wing setae short. Wing-retaining setae short and straight, posterior pair 30μ long, anterior pair not distinct from tergal lateral setae; tube weakly constricted at apex and sub-basally. Sternite accessory setae less than 10μ medially, up to 15μ laterally.

♂ macropterous. Colour and structure similar to female; fore tarsal tooth rather smaller; tergite IX B_3 reduced; navicula of genitalia with elongate acute apex.

Measurements (in microns) of holotype ♀ with allotype ♂ in parentheses. Body length 3600 (3700). Head, length 415 (385); median width 310 (270); postocular seta 16. Pronotal shield, length 305 (285); median width 435 (400); epimeral seta 45 (40). Fore wing, length 1650 (1500); distal width 320 (320); sub-basal setae 30–35; number of duplicated cilia 14–16. Tergite IX, B_1 350 (305); B_2 300 (240); B_3 260 (160). Tube, length 370 (275); terminal setae 360 (350). Antennal segments length, 80; 70; 152; 104; 90; 84; 80; 32 (72; 68; 135; 97; 90; 80; 70; 30).

Material studied. Holotype ♀. Queensland: 50 miles south west of Dalby, in between tied green phyllodes of *Acacia harpophylla*, 16.vii.1968 (*L. A. Mound* 734), in ANIC.

Allotype ♂ with 12 ♀, 1 ♂ paratypes collected from similar phyllodes on same group of trees as holotype, in ANIC and BMNH.

This species is remarkable among leaf-feeding Tubulifera in the almost complete absence of cuticular pigment. It was collected between pairs of tied phyllodes on *Acacia harpophylla* in association with *Lichanothrips pulchra*, *L. magnificus*, *Akainothrips citritarsus*, and the two species of *Xaniothrips* described below. There was no evidence that the phyllodes were tied together by lepidopterous larvae and the author has suggested below that the *Xaniothrips* species were responsible for sticking the phyllodes together with a secretion.

Lichanothrips magnificus sp. n.

(Text-figs 66 & 90)

♀ macropterous. Colour golden brown, dark brown on pterothorax, median longitudinal part of head, tube and last two abdominal segments, also median part of anterior abdominal segments and mid and hind legs; antennae yellow, III–VII with brown apices; distal half of fore wing shaded; major setae light brown, terminal setae of tube dark.

With the characters given above in the generic definition and key to species.

Measurements (in microns) of holotype. Body length 8000. Head, length 760; width at postocular setae 350. Pronotal shield, length 620; median width 660. Fore wing, length 3200; distal width 600; number of duplicated cilia 36. Sternite VII, posteroangular tubercle 60. Tergite IX, B_1–B_3 450. Tube, length 600. Antennal segments length, 150; 110; 290; 200; 180; 150; 100; 50.

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: 50 miles south west of Dalby, in between tied green phyllodes of *Acacia harpophylla*, 16.vii.1968 (*L. A. Mound* 734), in ANIC.

The unique holotype of this species was collected with a series of both sexes of *pulchra* Girault, and at first it was thought to be an oedymerous individual of that species. However large females of *pulchra* have greatly broadened fore femora, whereas these are almost slender in *magnificus* (Text-figs 65 & 66). Moreover the pronotum is unusually short in this unique specimen, and the fore tarsal tooth is very similar to that of *albus* described above.

Lichanothrips pulchra (Girault) **comb. n.**

(Text-figs 65 & 89)

Adiaphorothrips pulchra Girault, 1927 (35) : 2.

Girault's holotype of this species is a teneral male but this has been compared with the series of both sexes listed below. This species is very similar to *shakespearella* but has a shorter broader head, particularly in the females and small males. The colour of the series from near Dalby varies from golden to dark brown, but the fore legs of the female are usually golden.

Measurements (in microns) of large and small female. Head, length 650 (580); median width 400 (370). Antennal III 260 (230). Pronotal shield, length 760 (600). Tube, length 540 (480).

Measurements (in microns) of holotype and a small male. Head, length 530 (500); median width 330 (290). Antennal III, 190 (180). Pronotal shield length 460 (380). Tube, length 340 (320).

MATERIAL STUDIED. Holotype ♂. QUEENSLAND: Wowan, in brigalow forest, 12.iv.1923 (*A. Girault*), in Queensland Museum.

QUEENSLAND: 50 miles south west of Dalby, 7 ♀, 3 ♂ in green tied phyllodes of *Acacia harpophylla*, 16.vii.1968 (*L. A. Mound* 734), in BMNH.

Lichanothrips semifuscipennis (Girault) **comb. n.**

(Text-fig. 70)

Adiaphorothrips semi-fuscipennis Girault, 1926 (34) : 1.

As is discussed above, this species shows similarities to the genus *Grypothrips*. It can be distinguished from the other members of *Lichanothrips* by the characters given in the key.

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: Rosewood, on Brigalow 8.viii.1924 (*A. Girault*), in Queensland Museum.

QUEENSLAND: Rockhampton, 1 ♀ in forest, 13.iv.1923 (*A. Girault*), in Queensland Museum.

Lichanothrips shakespearella (Girault) **comb. n.**

Adiaphorothrips shakespearella Girault, 1927 (35) : 2.

This species was based on a male and female apparently collected with *Grypothrips curiosus*. These specimens are intermediate between *pulchra* and *magnificus* but can be distinguished by means of the key above.

Measurements (in microns) of syntype female. Head, length 610; median width 350. Antennal III, 210. Pronotal shield, length 590. Tube, length 470.

MATERIAL STUDIED. Syntype ♀ & ♂. QUEENSLAND: Wallumbilla, 17.x.1923 (*A. Girault*), in Queensland Museum.

QUEENSLAND: Wowan, 1 ♀ in forest, 12.iv.1923 (*A. Girault*), in Queensland Museum.

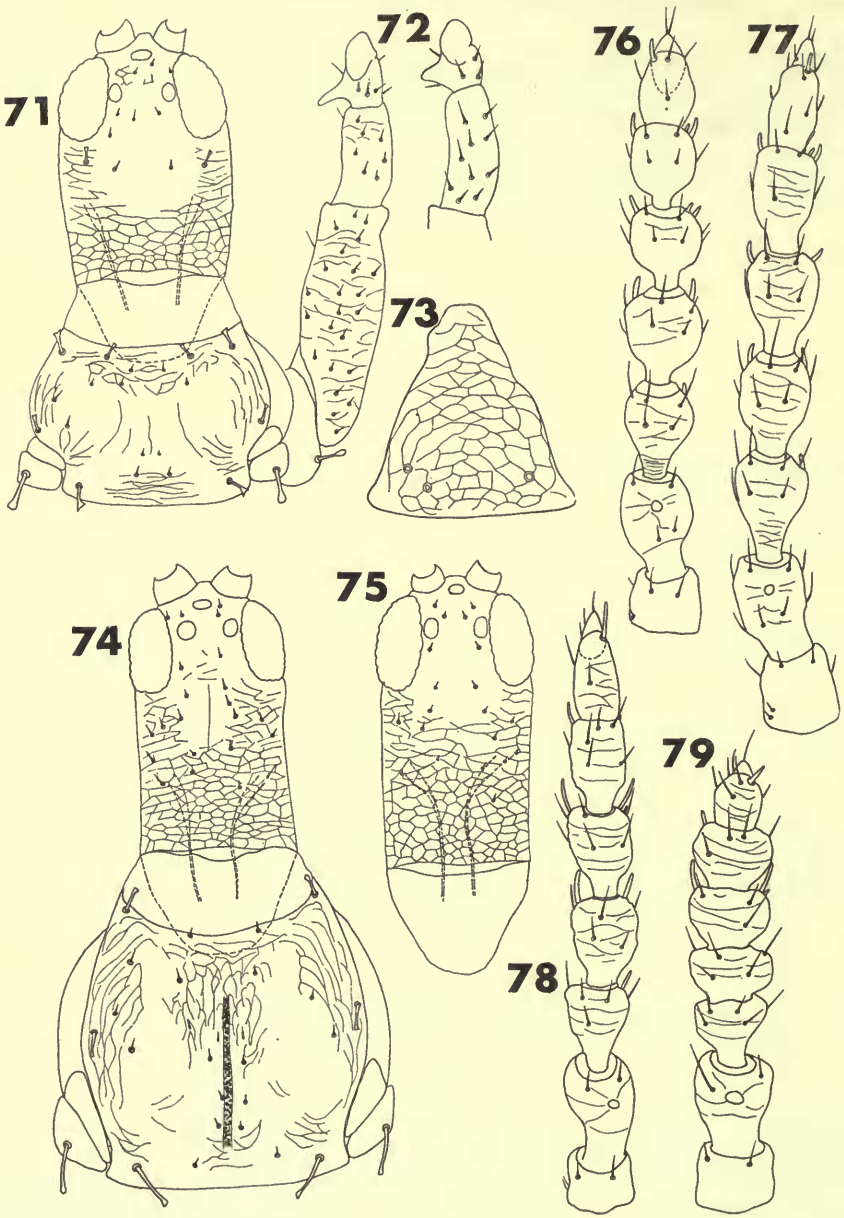
ONCOTHRIPS Karny

Oncothrips Karny, 1911 : 567–568. Type-species: *O. tepperi* Karny, by monotypy.
Brithothrips Moulton, 1942 : 8. Type-species: *B. fuscus*, by monotypy. **Syn. n.**
Diplonychothrips Moulton, 1968 : 103. Type-species: *D. antennatus*, by monotypy. **Syn. n.**

Dark brown, usually macropterous, species of Phlaeothripinae causing galls on *Acacia* phyllodes. Head longer than wide, postocular and pronotal setae hyaline, short and expanded, frequently absent. Maxillary stylets low in head, not meeting medially; mouth cone short and rounded. Antennae eight-segmented, III with one sense cone, IV with two sense cones; IV–VI with sharply constricted basal neck; VII weakly constricted at base, closely joined to VIII. Pronotal shield wider than long, epimeral sutures complete; praepectus absent, mesoprasternum absent medially; fore femur moderately swollen; fore tibia without apical tubercle; fore tarsus with a stout tooth in both sexes, but this is larger in females. Mesonotal lateral setae expanded; metanotal medial setae short and finely acute. Fore wings pale, evenly wide, with two or three expanded sub-basal setae and 10–15 duplicated cilia. Pelta elongate triangular but with lateral margins frequently sinuous; tergites II–VII with two pairs of sigmoid wing-retaining setae; posteroangular seta on tergites II–VI much shorter than B_1 marginal seta; tergite IX with B_1 and B_2 subequal and expanded in both sexes, B_3 longer and usually acute. Tube shorter than head, evenly narrowed to apex, terminal setae about as long as tube. Sternites with median transverse row of about 15 accessory setae, these setae about half as long as median marginals; male sternite VIII with circular glandular area.

Oncothrips is related to *Kladothrips* but has a more slender fore tibia, which lacks an apical tubercle. Moreover the pronotum is not longer than wide, the males have a large glandular area on sternite eight and there are only two sense cones on the fourth antennal segment. Some species of *Katothrips*, the new genus described above, show similarities to *Oncothrips* species, but they have a well developed maxillary bridge and the fore wings lack duplicated cilia.

Brithothrips was erected for a single species, *fuscus*, which is discussed below as a synonym of *tepperi* Karny. *Diplonychothrips* can be distinguished from *Oncothrips* by the presence of a full set of five pronotal major setae and the rather shorter head. However the males of the type-species *antennatus* sometimes lack anteromarginal setae, and in *rodwayi* the postocular and pronotal setae are not constant in their development. Moreover the new species described below, *habros*, has a head and fore tarsus similar to *antennatus* but has very reduced pronotal setae.



FIGS 71–79. *Oncothrips* species: 71, *antennatus*, head, pronotum and fore leg of female. 72, *antennatus*, fore tibia and tarsus of male. 73, pelta of *rodwayi*. 74, *tepperi*, head and pronotum of micropterous female. 75, *tepperi*, head of macropterous female. 76–79. Antennae: 76. *antennatus*. 77. *rodwayi*. 78, *tepperi*, macropterous female. 79, *tepperi*, micropterous female.

The variation within *Oncothrips* is very confusing. Short winged, oedymerous forms are not uncommon in *tepperi* but have not been found in other species. However a single dwarf or extreme gynaecoid specimen has been studied of both *antennatus* and *rodwayi*, and further collections will surely increase the known range of variation. Because of this variation as well as the sexual dimorphism of the fore tarsal tooth the following key must be regarded as provisional.

KEY TO THE SPECIES OF *ONCOTHRIPS*

1 Cheeks parallel or weakly concave (Text-figs 74 & 75), extreme gynaecoid individuals may have convex cheeks but these have the fore tarsal tooth about as broad as long 2
– Cheeks convex (Text-figs 42 & 71); female with fore tarsal tooth slender, about twice as long as basal width 3
2 Maxillary stylets 1/3–1/5th of head width apart; tube relatively long, ♀ tube about 0·8 of head length, ♂ tube about 0·7 of head length; postocular setae sometimes expanded at apex; lateral margins of pelta sinuate; in galls on *A. melanoxylon* ***rodwayi*** (p. 443)
– Maxillary stylets closer together, 1/7–1/9th of head width apart; tube shorter, macropterae—♀ tube 0·65 of head length, ♂ tube 0·5 of head length; micropterae—♀ tube 0·55 of head length, ♂ tube 0·45 of head length; postocular setae never expanded at apex; lateral margins of pelta usually not sinuate; in galls on *A. oswaldi* et alia . . . . . ***tepperi*** (p. 444)
3 Pronotum of female with five pairs of major setae, anteromarginals sometimes reduced in ♂; postocular seta usually developed (Text-fig. 71); in galls on *A. aneura* ***antennatus*** p. 441)
– Pronotum of female with only epimeral setae well developed; postocular seta absent (Text-fig. 42) . . . . . ***habrus*** (p. 442)

Oncothrips antennatus (Moulton) **comb. n.**

(Text-figs 71, 72 & 76)

Diplonychothrips antennatus Moulton, 1968 : 103–104.

This species is unusual in the *Kladothrips* group in having a complete set of pronotal major setae. *Rhopalothripoides* may be related but this is not certain as no macropterous specimens are known of the only species. *O. antennatus* is widespread in Central Australia and probably occurs throughout the area occupied by its host plant Mulga (*A. aneura*). The galls produced by this species are elongate pouched-shaped, similar to the galls of *tepperi* and *rodwayi* but about one inch long and almost tubular. Some of the galls contained over three hundred individuals. The contents of two galls collected 43 miles west of Alice Springs were 140 ♀, 8 ♂, 150 larvae and 210 ♀, 10 ♂, 200 larvae. This excess of females over males was found quite commonly in this species, but one gall collected near Ayers Rock contained 120 ♂, 100 larvae and no females at all. This suggests that males are produced parthenogenetically in *antennatus*, and that the contents of this gall were produced by an unfertilised female.

Some of the females collected near Eulo in Queensland had their abdominal intersegmental membranes expanded, but not as greatly as is recorded in *Kladothrips augonsaxxos* and the *Onychothrips* species. The tubular galls of *antennatus* are apparently more easily entered by inquiline species than spherical galls. A species of Chloropid fly was reared from tubular galls collected near Alice Springs and also at Ayers Rock.

♀ macropterous. Colour brown to dark brown; fore tibiae yellow distally, fore tarsi and antennal III yellow; wings and major setae pale, wing cilia dark; terminal setae of tube dark. With the morphological characters given in the generic definition and key to species above.

Measurements (in microns) of one ♀ from near Alice Springs. Body length 2500. Head, length 240; maximum width 180; postocular seta 30. Pronotal shield, length 165; median width 270; epimeral seta 50. Fore wing, length 900, distal width 100; sub-basal setae 28–32; number of duplicated cilia 11. Tergite IX, B_1 60; B_2 70; B_3 100. Tube, length 225; basal width 93; terminal setae 190. Antennal segments length, 30; 50; 52; 52; 45; 45; 52; 13.

♂ macropterous. Colour similar to female; pronotal anteromarginal setae sometimes reduced; fore tarsal tooth less acutely pointed than in female (Text-fig. 72); sternite VIII with large oval glandular area, 80μ long by 130μ wide.

Measurements (in microns) of one ♂ from near Alice Springs. Body length 2400. Head, length 240; maximum width 170; postocular seta 30. Pronotal shield, length 170; median width 270. Tergite IX, B_1 67; B_2 65; B_3 110.

Material studied. Holotype ♀. South Australia: North Flinders Range, Owieandana, [40 miles east of Leigh Creek], xi.1924 (*Hale & Tindale*), in California Academy of Sciences (Moulton, No. 3171).

South Australia: Mulga Park, 200 miles south west of Alice Springs, 11 ♀, 1 ♂ in gall on *Acacia aneura*, 25.x.1967 (*L. A. Mound* 291t). Northern Territories: Ayers Rock, 27 ♀, 19 ♂ in galls on *A. aneura*, 24.x.1967 (*L. A. Mound* 289t); 43 miles west of Alice Springs, 52 ♀, 34 ♂ in galls on *A. aneura*, 21.x.1967 (*L. A. Mound* 277t). Queensland: 25 miles SSW of Eulo, 11 ♀, 6 ♂ in galls on *A. aneura*, 17.x. 1968 (*J. A. L. Watson*), in BMNH.

Oncothrips habrus sp. n.

(Text-fig. 42)

♀ macropterous. Colour brown, head and tube dark brown; fore tibiae and apex of fore femora light brown, fore tarsi yellow; antennal III yellow, IV–VI light brown; major setae and fore wings pale.

Head with no major setae, faintly reticulate particularly at base, cheeks weakly convex; maxillary stylets wide apart, retracted to position of postocular setae (Text-fig. 42). Pronotum transverse, epimeral setae 32μ long, apex assymetric 13μ wide; anteroangular and posteroangular setae expanded but only 10μ long, the basal pores well developed 4μ wide. Mesonotal lateral setae expanded 13μ long. Metanotum reticulate with three pairs of small acute median setae. Fore wing with 11 duplicated cilia; two pairs of sub-basal setae 10–13μ long. Pelta elongate triangular, 100μ long, 80μ wide at base; tergites III–VI with posterior wing retaining setae flattened, 7μ broad; tergite IX seta B_3 not clearly visible in unique holotype, probably not acute at apex.

Measurements (in microns) of holotype. Body length 2000. Head, length 240; median width 145. Pronotal shield, length 135; median width 210. Fore wing, length 700; distal

width 80. Tergite IX, B_1 35; B_2 45; B_3 80. Tube, length 145; terminal setae 210. Antennal segments length, 26; 40; 32; 32; 35; 38; 38; 10.

MATERIAL STUDIED. Holotype ♀. NEW SOUTH WALES: Trangie, in gall on *Acacia pendula*, 7.iii.1968 (*L. A. Mound* 556), in ANIC.

The unique female on which this species is here described was thought at first to be a gynaecoid specimen of one of the other *Oncothrips* species. However it differs from *rodwayi* in having short major setae on tergite nine, from *antennatus* in having reduced pronotal setae, from *tepperi* in the position of the maxillary stylets in the head, and from all three of these species in the greater length of the terminal setae relative to the tube. Moreover it is unlikely that the holotype is gynaecoid in view of the long and slender fore tarsal tooth.

Oncothrips rodwayi (Hardy) **comb. n.**

(Text-figs 73 & 77)

Kladothrips rodwayi Hardy, 1915 : 102–103.
Cryptothrips tithonus Girault, 1928 (42) : 3. **Syn. n.**
Kladothrips froggatti Bagnall, 1929*b* : 196. **Syn. n.**
Kladothrips rodwayi Hardy; Bagnall, 1929*b* : 194–195.

As Bagnall pointed out, the original description of this species is remarkably confusing. Hardy states 'antennae generally very pale yellow, sometimes black'. This statement may be due to the fact that the three syntypes mounted on a slide by Hardy and now deposited in the Australian Museum, Sydney were strongly bleached with caustic potash. There are four normal syntypes in Dr H. Priesner's collection in Linz, Austria. Girault's statement that the head of *tithonus* is longer than that of *rodwayi* may be due to the fact that the Hardy syntypes are crushed, making the head appear relatively short and broad. The type-slide of *tithonus* bears three females and one of these has the postocular seta on one side elongate. The seta on the other side of the head, and the postocular setae of the other specimens are all short. Bagnall's (1929 : 197) record of *intermedius* (=*tepperi*) from Gippsland with *Koptothrips flavicornis* is a misidentification of *rodwayi*.

This species causes galls on the phyllodes of *Acacia melanoxylon*, and it probably has the same geographical range as this tree, i.e. Tasmania and the South Eastern Highlands and coastal regions from Adelaide to the New South Wales/Queensland border. The galls are purse-shaped, like a large cockroach ootheca, about 1 cm long and 75 mm deep. In an attempt to establish at what time of the year these galls are produced Mrs H. V. Andrewartha collected at monthly intervals from February until June 1968 on a tree near Adelaide. However the author could not find any differences in the contents of these galls from samples collected in October and November 1967. On each collecting date galls were found containing males, females and larvae.

No oedymerous or short winged forms have been found of *rodwayi*, although one dwarf male was collected near Adelaide. This dwarf male has seta B_3 on tergite

nine expanded at the apex instead of acute as is normal in this genus. The postocular setae are variable in their development in each of the series studied. Usually the postocular setae are no longer than the other head setae, but a few specimens have one or both postoculars well developed and expanded, 10–13μ long. The pelta, with its sinuous lateral margins (Text-fig. 73) is quite distinctive in this species.

Measurements (in microns) of one ♀ from near Adelaide. Body length 2650. Head, length 290; median width 175. Pronotal shield, length 195; median width 290; anteroangular seta 26; midlateral seta 20; posteroangular seta 23; epimeral seta 32 with assymetric apex 6μ wide. Mesonotal midlateral seta 20. Fore wing, length 1000; distal width 100; sub-basal setae 25–30; 14 duplicated cilia. Tergite IX, B_1 65; B_2 63; B_3 115. Tube, length 240; terminal setae 210. Antennal segments length 40; 50; 55; 52; 55; 55; 55; 23.

Measurements (in microns) of one ♂ from near Adelaide. Body length 2400. Head, length 260; median width 165. Pronotal shield, length 160; median width 245; epimeral seta 32. Fore wing, length 950; distal width 95; 10 duplicated cilia. Diameter of sternal gland on VIII 50. Tergite IX, B_1 65; B_2 65; B_3 85. Tube, length 190; terminal setae 175.

Material studied. Syntypes. Tasmania: Hobart, in galls on *Acacia melanoxylon*, May 1915 (*Rodway*), 3 ♀ in Australian Museum, Sydney, 4 ♀ in H. Priesner Collection, Linz.

Syntypes of *tithonus*. New South Wales, Bulli Pass, 3 ♀, 1.iv.1918 (*G. H. Hardy*); 'paratypes' [sic] of *tithonus*, Victoria: Fern Tree Gulley, 2 ♀, iii.1918 (*G. H. Hardy*), in Australian Museum, Sydney.

Syntypes of *froggatti*. Tasmania: 6 ♀, in galls on *Acacia* sp., 7.ix.1903 (*A. M. Lea*); Tasmania, Devonport, 3 ♀, forming blister-galls on Blackwood (*Acacia melanoxylon*), 1.ix.1902 (*W. W. Froggatt*), in BMNH.

Victoria: Otway Forest, 1 ♀, in ANIC; Kalorama, Jeeves Gulley, 3 ♀ in galls on *A. melanoxylon;* 17.ii.1929 (*R. Kelly*); Gippsland, 1 ♀ on *Acacia* sp. (*C. French*); Black Spur, 10 miles north of Healesville, 8 ♀ beaten from *A. melanoxylon*, 15.xi. 1967 (*L. A. Mound* 362), in BMNH. South Australia: West Stirling, near Adelaide, numerous ♂♂, ♀♀ and larvae on various dates between x.1967 and vi.1968 in galls on *A. melanoxylon* (*H. V. Andrewartha & L. A. Mound*), in BMNH.

Oncothrips tepperi Karny **comb. rev.**

(Text-figs 74, 75, 78 & 79)

Oncothrips tepperi Karny, 1911 : 569–571.
Kladothrips tepperi (Karny) Bagnall, 1929*b* : 195–196.
Kladothrips intermedius Bagnall, 1929*b* : 196–197. **Syn. n.**
Brithothrips fuscus Moulton, 1942 : 8–10. **Syn. n.**
Brithothrips fuscus (Moulton); Mound, 1970*b* : 159–172.

The single female from Gippsland, Victoria collected with *Koptothrips flavicornis* and referred to by Bagnall as *intermedius* is here regarded as a specimen of *rodwayi*. The types of *intermedius* are fully expanded, macerated and crushed, whereas the two syntypes of *tepperi* in Bagnall's collection are not only rather small, they are

both strongly telescoped. This difference in the preparation of the specimens accounts for most of the differences between the nominal species. The data on the slides of *intermedius* may not be correct. It is possible that the specimens were collected at some distance inland, where the host plant *Acacia oswaldi* lives, and merely posted to Bagnall from Melbourne. This type of error is not uncommon with some of the early records from Australia.

The nominal species *Brithothrips fuscus* was based on four females and one 'male', although the latter specimen has recently been shown to be a female (Mound, 1970*b*). The fore tarsal teeth are broken off in the holotype and the three paratypes labelled as females. The author has recently suggested that this damage happened when the specimens were being put on to slides, but several further specimens have now been studied which were taken in the field by the author with broken fore tarsal teeth. The holotype of *fuscus* is an oedymerous, dealate (probably hemimacropterous) female, and the 'allotype' is a normally developed female.

The pattern of variation in this species is extremely confusing and an account of the variants found within a single gall has recently been given under the name *fuscus* (Mound, 1970*b*). Most specimens that have been studied are fully macropterous, but populations have been found in which individuals vary from micropterous to fully macropterous. This continuous variation in wing length is unusual in Thysanoptera, most species occurring as invariable morphs, e.g. micropterae or hemimacropterae. In *O. tepperi* the degree of wing development is correlated with allometric growth of other parts of the body. The micropterous specimens are always oedymerous with greatly enlarged pronotum and fore legs, and foreshortened antennae and head. Males are rather smaller than females with a less well developed fore tarsal tooth, but both sexes can show varying degrees of wing reduction and oedymerism, and also varying degrees of body size. Two small micropterous females collected by the author near Gilgandra, N. S. W. are particularly interesting as they both have seta B_3 on tergite nine expanded at the apex instead of acute. The body length of these specimens is about 1900μ, and the apex of this seta may possibly be correlated with very small body size. The same character is noted above on a dwarf male of *rodwayi*. Small individuals of *tepperi* have the pronotal major setae very much smaller than large individuals.

O. tepperi has been collected by the author at several localities on *Acacia oswaldi*. The galls on this plant are very similar to the galls produced by *rodwayi* on *A. melanoxylon*. These two species of *Oncothrips* are closely related and it seems likely that the two host-plants are also related to each other. However *tepperi* is unusual in the Australian gall forming thrips in being polyphagous, a habit which is possibly related to its morphological variability. An insect species in which the physiology is sufficiently labile to allow a range of morphological variants to coexist is also likely to have a physiology able to accept more than one host plant. *O. tepperi* was originally described from *A. sclerophylla*, and the author has collected specimens from a gall on an herbarium specimen of *A. homalophylla* in the CSIRO Herbarium at Canberra. Two related species of Cosmopterygid moths (det. I. Common) were bred from galls of *tepperi* on *oswaldi* from Loxton S.A. and Peak Hill, N. S. W., but there was no indication as to how the caterpillars originally entered the galls.

Measurements (in microns) of one macropterous ♀ with one micropterous ♀ in parentheses. Body length 2500 (2300). Head, length 320 (260); median width 155 (152). Pronotal shield, length 260 (260); median width 275 (290); epimeral seta 50. Fore wing, length 950 (250); distal width 100; 14 duplicated cilia. Pelta, length 130 (110). Tergite IX, B_1 45 (45); B_2 58 (58); B_3 100 (90). Tube, length 195 (145); terminal setae 195 (115). Antennal segments length, 32 (40); 55 (42); 50 (32); 50 (30); 52 (30); 55 (40); 50 (25); 10 (10).

Measurements (in microns) of one macropterous ♂. Body length 2300. Head, length 275; median width 145. Pronotal shield, length 175; median width 240; epimeral seta 35. Fore wing, length 800; distal width 70. Tergite IX, B_1 50; B_2 70; B_3 70. Tube, length 130; terminal setae 160. Antennal segments length, 32; 50; 42; 45; 45; 50; 42; 10.

MATERIAL STUDIED. Syntypes 2 ♀ [SOUTH AUSTRALIA: Petersburg (? Peterborough), in galls on *Acacia sclerophylla* (*A. G. Edquist*)], in BMNH.

Lectotype ♀ of *intermedius* with 1 ♀, 1 ♂. VICTORIA: Melbourne, on *Acacia* (*E. T. Carter*), in BMNH, but see above for comment on this data.

Holotype ♀ of *fuscus*. SOUTH AUSTRALIA: Pimba, in *Acacia* galls, iv.1929 (*R. J. Greenfield*), in California Academy of Sciences (Moulton No. 3526).

'Allotype ♂' of *fuscus* (actually a ♀). NEW SOUTH WALES: on *Acacia oswaldi*, 2.vi.1928 (*W. W. Froggatt*), in California Academy of Sciences (Moulton No. 2951).

SOUTH AUSTRALIA: Loxton Agricultural Research Station, in galls on *Acacia oswaldi*; 3 ♂, 16 ♀ (5 short winged), 30.xi.1967 (*L. A. Mound* 393); 28 ♀ (6 short winged), 7.iii.1968 (*R. Brewer*), in BMNH. NEW SOUTH WALES: Peak Hill, 21 ♀ (4 short winged), 10 ♂ (1 short winged), in galls on *A. oswaldi*, 8.iii.1968 (*L. A. Mound* 564); Collie 8 ♀, 3 ♂, (all micropterous), in galls on *A. homalophylla* in CSIRO Herbarium 14.ix.1950; 23 miles south of Gilgandra, 2 ♀, 1 ♂ (all micropterous), in galls on *A. pendula* or *oswaldi*, 6.vi.1968 (*L. A. Mound* 675), in BMNH; Leeton, 58 ♀, 4 ♂ in blister galls on *A. oswaldi*, 1.vi.1928 (*K. McKeawan*); Ungarie, 12 ♀ in Milgee or Rosewood galls, 5.ix.1926, in ANIC. QUEENSLAND: Pentland, 2 ♀ on *A. oswaldi*, 19.x.1935; 16 miles south of Eulo, 2 ♀ on *A. oswaldi*, 23.x.1948, in ANIC.

ONYCHOTHRIPS Karny

Onychothrips Karny, 1911 : 565. Type-species: *Phloeothrips* [sic] *tepperi* Uzel, by monotypy.

Large black, macropterous Phlaeothripinae causing phyllode galls on *Acacia aneura*. Head longer than wide, rounded in front, overhanging bases of antennae; cheeks parallel, postocular setae small; maxillary stylets close together in middle of head, retracted to postocular setae; mouth cone short and rounded. Antennae eight-segmented, III with one sense cone, IV with two sense cones. Pronotal shield as wide as long, or wider than long; anteromarginal setae not developed, remaining major setae pale with expanded apices; epimeral sutures complete; praepectus absent, mesopraesternum reduced to two lateral triangular plates. Fore femora moderately enlarged; fore tibiae with a large or small apical tubercle, this is reduced in males; fore tarsus with a stout tooth, this is smaller in ♂ than in ♀. Mesonotal lateral setae expanded; metanotum reticulate with one pair of median setae; fore wings broad, two pairs of sub-basal setae. Pelta wider than long; tergites II–VII with two pairs of sigmoid wing-retaining setae; posteroangular tergal seta well developed; tergite IX B_1 and B_2 equal in length in both sexes. with apices expanded; tube rather long, narrowing to apex, terminal setae shorter than tube, Sternites with transverse row of short accessory setae; sternite VIII of male usually with no glandular area, although the chitin is porous medially in some larger specimens.

The two species included in this genus have a very similar head and pronotum but differ considerably in the lengths of their tubes. Both species have strong similarities to *Kladothrips augonsaxxos*, and as is pointed out above, the host-plants of these three species are placed in the Section Juliflorae of the genus *Acacia*. The pronotum and fore femora of *Kladothrips* species are longer and the tube is shorter than in *Onychothrips* species. The pelta is elongate triangular in *Kladothrips* species whereas it is broadly triangular in *Onychothrips*. However the head, and fore tibiae and tarsi of *tepperi* are very similar to *augonsaxxos* and the two genera are very closely related. *Oncothrips* species have similar, although shorter, antennae with two sense cones on the fourth segment, but these species have a strongly transverse pronotum and no tubercles on the apex of the fore tibiae. The larger species of *Koptothrips* are also similar to *Onychothrips* but have three sense cones on the fourth antennal segment and a characteristic broad shiny pronotal shield.

KEY TO THE SPECIES OF *ONYCHOTHRIPS*

1 Tube longer than head; fore tibia short and stout, particularly in ♀, with small apical tubercle (Text-fig. 80); metanotal median setae with expanded apices; pronotal shield of ♀ as long as wide . . . . . ***tepperi*** (p. 449)

– Tube shorter than head; fore tibia slender with large flat plough-shaped tubercle at apex, but this is reduced in large males (Text-figs 82 & 83); metanotal median setae acute; pronotal shield wider than long in both sexes . . . ***arotrum*** (p. 447)

Onychothrips arotrum sp. n.

(Text-figs 82 & 83)

♀ macropterous. Dark brown to black, fore tibiae and tarsi yellow with brown markings; antennae light brown, III and apex of II yellowish; fore wing pale, cilia dark; major setae pale, terminal setae of the tube dark.

With the morphological characters given above in the generic definition and key to species. Postocular setae expanded, 30μ long, but frequently not distinguishable from remaining head setae. Fore tarsal tooth very large in large individuals, but fore tibial tubercle relatively larger in small individuals. Setae much longer and pelta more elongate in large than in small individuals.

Measurements (in microns) of a large ♀ from Coober Pedy with a small ♀ from Ayers Rock in parentheses. (Table I indicates the range within one gall). Body length 3500 (2500). Head, length 320 (260); median width 210 (165). Pronotal shield, length 350 (225); median width 390 (300); epimeral seta 105 (60). Mesonotal midlateral seta 52 (26). Fore wing, length 1250 (1000); number of duplicated cilia 26 (15). Tergite IX, B_1 145 (84); B_2 165 (80); B_3 165 (110). Tube, length 290 (210); terminal setae 190 (130). Antennal segments length, 32 (30); 65 (50); 77 (55); 70 (55); 70 (52); 55 (50); 55 (50); 18 (15).

TABLE I

Three ♀♀ of *O. arotrum* from one gall, Bon Bon, South Australia

Lengths in microns

Head	Pronotum	Epimeral seta	Antennal III	Tube
300	335	100	74	290
290	285	80	68	260
280	225	70	60	225

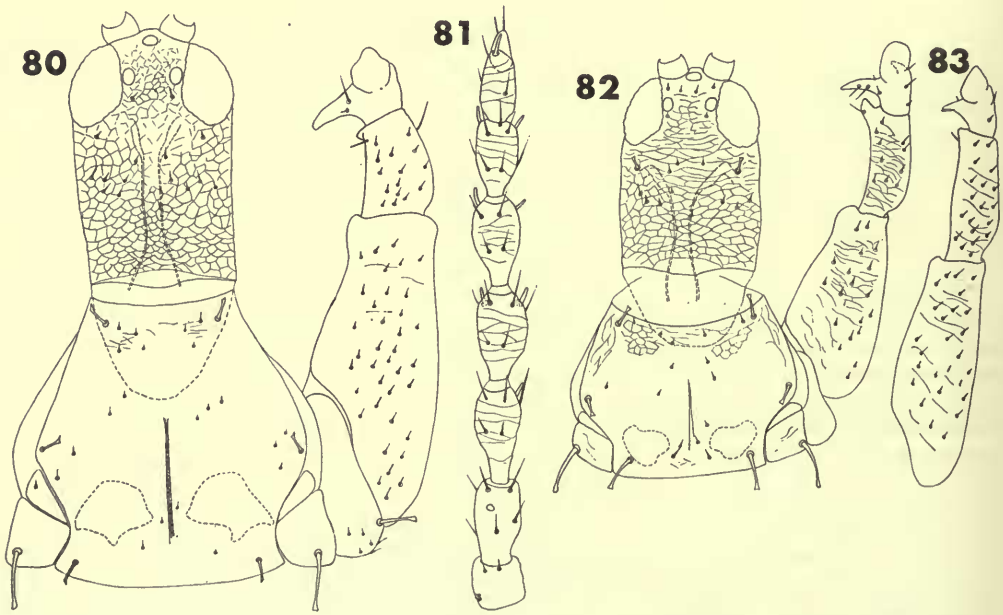
♂ macropterous. Colour and structure similar to female. Large individuals have an irregular circular glandular area on sternite VIII, but this does not have a definite margin and is only faintly indicated in small males by porous chitin within the normal reticulation.

Measurements (in microns) of a large ♂ with a small ♂ in parentheses. Body length 2600 (2100). Head, length 275 (240); median width 195 (175). Pronotal shield, length 275 (175); median width 320 (275); epimeral seta 80. Tergite IX, B_1 145 (90); B_2 145 (95); B_3 145 (?). Tube, length 225 (175).

MATERIAL STUDIED. Holotype ♀. SOUTH AUSTRALIA: Bon Bon Homestead, 50 miles north of Lake Gairdner, in gall on *Acacia aneura* var. *latifolia*, 27.x.1967 (*L. A. Mound* 305s2), in ANIC.

Allotype ♂ and 10 ♀, 5 ♂ paratypes collected in same gall as holotype, also 1 ♀ in a second gall on the same tree, in BMNH.

SOUTH AUSTRALIA: Mulga Park, 200 miles SW of Alice Springs, 2 ♀ in gall on *A. aneura*, 25.x.1967 (*L. A. Mound* 291); 10 miles south of Welbourne Hill, 48 ♀, 7 ♂ in gall on *A. aneura* in dry creek bed, 26.x.1967 (*L. A. Mound* 302), in BMNH; NW of Coober Pedy, 11 ♀ in globular galls on *A. aneura*, 19.v.1966, in BMNH and Waite Institute. NORTHERN TERRITORIES: 40–50 miles west of Alice Springs, 25 ♀, 7 ♂ in galls on *A. aneura*, 21 & 22.x.1967 (*L. A. Mound* 277 & 286); Ayers Rock, 32 ♀, 9 ♂ in galls on *A. aneura*, 24.x.1967 (*L. A. Mound* 290), in BMNH; Alice Springs, 5 ♀ in galls on Mulga, 23.vi.1967 (*C. E. Chadwick*), in ANIC. QUEENSLAND: 25 miles SSW of Eulo, 4 ♀ in galls on *A. aneura*, 17.x.1968 (*J. A. L. Watson*), in BMNH. NEW SOUTH WALES: Broken Hill, 6 ♀ in galls on Mulga, x.1929, in ANIC.



FIGS 80–83. *Onychothrips* species. 80–81. *tepperi*: 80, head, pronotum and fore leg of female. 81, antenna. 82–83. *arotrum*: 82, head, pronotum and fore leg of female. 83, fore leg of male.

The size variation in this species is very great, and the relative lengths of some setae do not remain constant throughout this size range. In large specimens the setae on tergite nine are about half as long as the tube, whereas in small specimens these setae are barely one-third as long as the tube. Similarly the head is shorter than the pronotum in large specimens but much longer than the pronotum in small ones. The variation of the fore tibial tubercles is particularly interesting as it is apparently weakly negatively heterogonic. The smallest females have a larger tubercle on the tibia than the largest females. The holotype has been chosen from a series of rather large individuals.

O. arotrum produces apparently identical galls to *tepperi* Uzel, and the two species have been collected at at least one site on the same tree. These galls are spherical with an external diameter of about 15 mm. The walls of a gall are sometimes about 2 mm thick, and they become very hard as they mature. One gall with an internal diameter of about 10 mm contained 750 adults and at least 500 immature stages. In most of the galls studied the males formed about 10% of the adult population, whereas in *tepperi* Uzel the sexes were commonly found in equal numbers. On several occasions females of *arotrum* were found with the abdominal intersegmental membranes distended, but never as much as in *Kladothrips* species. The second instar larvae of *arotrum* have long slender and acute prothoracic setae, whereas in *tepperi* these setae are shorter with a clearly rounded apex.

Onychothrips tepperi (Uzel)

(Text-figs 80 & 81)

Phloeothrips [sic] *Tepperi* Uzel, 1905 : 99–102.
Onychothrips tepperi (Uzel) Karny, 1911 : 565–567.
Onychothrips hakeae Bagnall, 1929*b* : 198–199. **Syn. n.**
Onychothrips hakeae Bagnall; Mound, 1968 : 142.

The lengths of the head, pronotum and abdominal setae of the type-series of *hakeae* fall within the range of variation of *tepperi* collected in galls on *Acacia aneura*. The original labels of the *hakeae* series, which were written by W. W. Froggatt, state 'Thrips from galls on *Hakea* or *Grevillea* foliage'. Moreover in Froggatt's collection there are several specimens of *tepperi* bearing the data 'N.S.W. Cobar, *Hakea* galls, 1910 (*Solomon*)'. These records of *Hakea* or *Grevillea* as a host plant for this insect require further substantiation because Australian xerophytic plants are difficult to identify in the absence of flowers or fruit. *Hakea* and *Grevillea* have a great range of leaf form, and several species look quite similar to *Acacia* species. Unfortunately thrips tend to attack the less healthy plants, and as a result it can be difficult to find a tree which bears both galls and flowers and fruit.

The galls of *tepperi* cannot be distinguished from those of *arotrum*, and the two species have been collected from the same tree. The author's host records for this species are all given as *A. aneura*, but it is possible that one or other of the *Onychothrips* species occurs on *Acacia brachystachia* as well. These two species of *Acacia* are not easy to separate. Notes on the sex ratio of *tepperi* and the recognition of the larvae are given above under *arotrum*.

♀ macropterous. Colour black, fore tibiae and tarsi yellow-brown; antennals II & III yellow, IV light brown, V & VI pale basally; wings pale with dark cilia; major setae pale. With the characters given in the generic definition and key to species above; surprisingly little variation in body size and proportions has been observed.

Measurements (in microns) of one ♀. Body length 3200. Head, length 300; median width 175. Pronotal shield, length 330; median width 315; epimeral setae 65; anteroangular setae 40. Mesonotal midlateral setae 50. Fore wing length 1300; number of duplicated cilia 20. Tergite IX, B_1 90; B_2 100; B_3 130. Tube, length 365; terminal setae 190. Antennal segments lengths, 32; 58; 64; 64; 58; 55; 55; 16.

♂ macropterous. Colour and structure similar to female but fore tibia more slender and tarsal tooth smaller; sternite VIII without a glandular area.

Measurements (in microns) of one ♂. Body length 2800. Head, length 260; median width 175. Pronotal shield, length 260; median width 310; epimeral setae 65. Tergite IX, B_1 130; B_2 135; B_3 135. Tube length 320.

Material studied. Syntype ♀. South Australia: in galls on *Acacia aneura*, ex collection of H. Uzel, in BMNH.

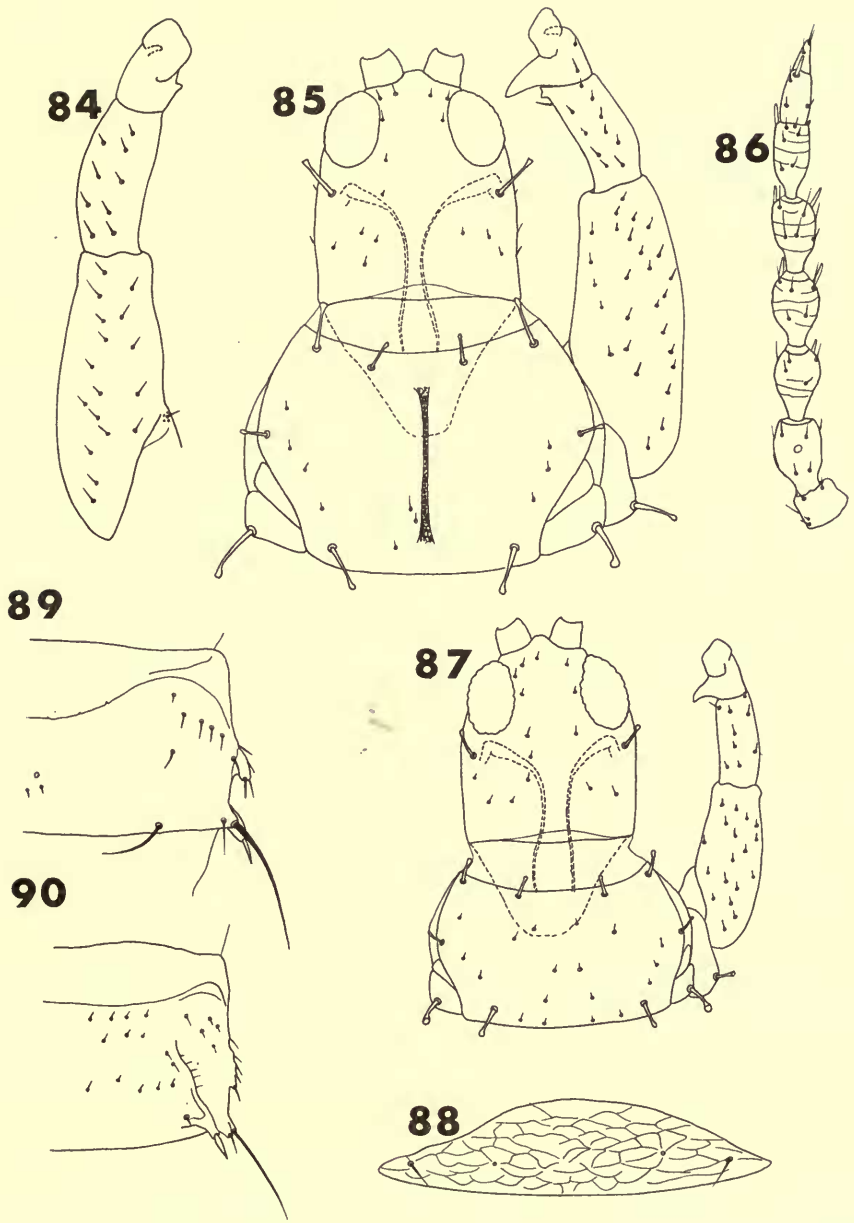
Lectotype ♀ of *hakeae* with 6 ♀, 2 ♂, New South Wales: Broken Hill, from galls on *Hakea* (*O. Lower*), in BMNH (see above for comment on this data). There are specimens with similar data in ANIC and NSW Department of Agriculture.

South Australia: Mulga Park, 200 miles SW of Alice Springs, 1 ♀ in gall on *A. aneura*, 25.x.1967 (*L. A. Mound* 291); 10 miles south of Welbourne Hill, 2 ♀ in gall on *A. aneura*, 26.x.1967 (*L. A. Mound* 302); Mable Creek, 30 miles west of Coober Pedy, 10 ♀, 5 ♂ in gall on *A. aneura*, 26.x.1967 (*L. A. Mound* 306), in BMNH; Mt. Willoughby, 16 ♀, 4 ♂ in Mulga leaf gall (*N. Ford*), in ANIC. Northern Territories: 40–50 miles west of Alice Springs, 32 ♀, 27 ♂ in galls on *A. aneura*, 22.x.1967 (*L. A. Mound* 286); Ayers Rock, 3 ♀ in galls on *A. aneura*, 24.x.1967 (*L. A. Mound* 289), in BMNH. New South Wales: Broken Hill, 24 ♀, 8 ♂ in *Acacia* galls, 26.iii.1928 (*Shepherd*); Pera Bore, 4 ♀ on *A. aneura*, 28.viii.1906 (*W. W. Froggatt*); Cobar, 3 ♀, 3 ♂ in *Hakea* galls, 1910 (*Solomon*) in ANIC. Queensland: 25 miles SSW of Eulo, 8 ♀ in galls on *A. aneura*, 17.x.1968 (*J. A. L. Watson*), in BMNH.

RHOPALOTHRIPOIDES Bagnall

Rhopalothripoides Bagnall, 1929*a* : 174. Type-species: *Rhopalothrips brunneus*, by original designation, here regarded as a synonym of *froggatti*.
Froggattothrips Bagnall, 1929*a* : 175. Type-species: *F. acaciae*, by original designation.
Rhopalothripoides Bagnall; Mound, 1968 : 148–149.

Froggattothrips was based on four individuals with a remarkably short broad outline. It is now realized that this shape is the result of telescoping of the body segments due to starvation prior to death. The genus has recently been redefined and at present includes only a single species. This is probably not related to the two American genera found on *Cactus* species, *Rhopalothrips* and *Scopaeothrips*. These two genera both have highly specialized cuticular sculpture and they are probably more closely related to the *Idiothrips* group, of which there are several species in Australia living at ground level. The New Caledonian species *Scopaeothrips intermedius* Bianchi has not been studied but it may be congeneric with *froggatti*. *Rhopalothripoides* is here regarded as an offshoot of the Australian *Kladothrips* group, but its relationships will be more easily studied if macropterous individuals can be found.



FIGS 84–90. 84–88. *Rhopalothripoides froggatti*: 84, fore leg of female. 85, large male. 86, antenna. 87, small male. 88, pelta. 89. *Lichanothrips pulchra*, tergite IV of female. 90. *Lichanothrips magnificus*, sternite V of female.

Rhopalothripoides froggatti (Bagnall)

(Text-figs 84–88)

Rhopalothrips froggatti Bagnall, 1916 : 411–412.
Rhopalothrips brunneus Bagnall, 1916 : 412. **Syn. n.**
Rhopalothripoides froggatti (Bagnall) Bagnall, 1929*a* : 174.
Rhopalothripoides kellyanus Bagnall, 1929*a* : 174–175. **Syn. n.**
Froggattothrips acaciae Bagnall, 1929*a* : 175–176. **Syn. n.**
Froggattothrips inconsequens Bagnall, 1929*a* : 176. **Syn. n.**
Rhopalothripoides brunneus (Bagnall); Mound, 1968 : 149.

The above synonymy is the result partly of the imperfect mounts on which the nominal species were based, and partly of the great range of size found in this species. The males are particularly variable, the holotype of *froggatti* being a very small gynaecoid male. In the gynaecoids the pronotum is short, but in oedymerous specimens it is as long as or longer than the head.

All the specimens which have been studied lack ocelli and wing-retaining setae, and have the pterothorax and pelta short and broad as is typical of apterous individuals. However, a short wing membrane is developed, about 50μ long, which bears one or more broadly expanded setae. Axillary sclerites cannot be distinguished, however. In most micropterous thrips it is usual for axillary sclerites and ocelli to develop before wing rudiments appear. It is remarkable that this species whose skeletal structure is so typically 'apterous' should possess a rudimentary wing membrane.

This species was originally collected in the leaf-glands of *Acacia dealbata* and *A. decurrens*. The present author has found it in abundance inside the leaf-glands of *A. parramattensis*. These glands, or domatia, are pits of doubtful function which occur on the adaxial surface of the rhachis of *Acacia* leaves between the bases of each pair of pinnae. The external aperture of one of these pits is usually about one millimetre in diameter, but the cavity is ovoid and may be three millimetres long and two millimetres across. Up to twenty eggs of *froggatti* have been seen inside one gland, and although usually only a single female, or a male and a female, were found inside each cavity, on one occasion the author observed three adults and one larva.

Measurements (in microns) of one small and one large male collected together at Laurieton, New South Wales. Body length 1100–1400. Head, length 145–175; maximum width 120–145; postocular seta 30–50. Pronotal shield, length 95–160; median width 175–235. Pelta, length 32–42; width 140–170. Glandular area on sternite VIII diameter 16. Tergite IX, B_1 32–35; B_2 32–35; B_3 65–80. Tube length 75–100. Antennal segments III–VIII length, 32–42; 32–42; 32–42; 32–42; 26–32; 16–20.

Material studied. Holotype ♂. New South Wales: Upper Mangrove, in leaf-glands of *Acacia decurrens*, 7.ix.1900 (*W. W. Froggatt*), in BMNH.

Holotype ♀ of *brunneus*. Victoria: *Acacia dealbata* (*R. Kelly*), in BMNH.

Holotype ♀ of *kellyanus*. Victoria: *Acacia dealbata*, collected with *brunneus* holotype (*R. Kelly*), in BMNH.

Holotype ♀ of *acaciae*. New South Wales: Termeil, *Acacia* sp., 27.ix.1899 (*W. W. Froggatt*), in BMNH.

Holotype ♀ of *inconsequens*. NEW SOUTH WALES: Termeil, *Acacia* sp., (with *acaciae* ♀ & 2 ♂), 27.ix.1899 (*W. W. Froggatt*), in BMNH.

QUEENSLAND: Brisbane, Mt. Coot-tha, 1 ♂ on *Acacia* sp. leaves, 22.iii.1968 (*L. A. Mound* 591). VICTORIA: Melbourne, Park Orchard, 11 ♀, 8 ♂ on *Acacia dealbata*, 7.ix.1934 (*H. G. Andrewartha*); Blackburn Lake Reservoir, 9 ♀, 1 ♂ on *Acacia mearnsii*, 17.xi.1967 (*L. A. Mound* 373). AUSTRALIAN CAPITAL TERRITORY: Canberra, O'Connor Quarry, 12 ♀, 10 ♂ in leaf glands of *Acacia parramattensis*, 19.v.1968 (*L. A. Mound* 658), in BMNH. NEW SOUTH WALES: Cooma, 3 ♀, 6 ♂, in *Acacia* galls, 7.iii.1961 (*E. M. Reed*); Laurieton, 8 ♀, 14 ♂, on *Acacia* sp., 26.x.1960 (*E. M. Reed*), in ANIC.

WARITHRIPS gen. n.

Type-species: *Warithrips maelzeri* sp. n.

Black macropterous species of Phlaeothripinae. Eyes large; cheeks with a small tooth behind eyes, with 2–5 pairs of cheek setae; mouth cone short and rounded; antennae eight segmented, one sense cone on III, three sense cones on IV. Pronotal anteromarginal setae weak; praepectus well developed, probasisternum large, mesopraesternum reduced to two lateral triangles. Fore femur of female with a row of tubercles on inner margin, femora of male simple; fore tibia with an apical tubercle in both sexes; fore tarsal tooth large in ♀ but small in ♂. Fore wings broad, cilia closely set, no duplicated cilia; only two major sub-basal setae. Metanotum and pelta reticulate; mesonotal lateral setae acute. Tergites II–VII with two pairs of wing-retaining setae; tergite IX with setae shorter than tube; tube shorter than head, terminal setae long and dark. Sternites with a transverse row of accessory setae; sternite VIII of ♂ with transverse glandular area which extends on to lateral quarters of tergite VIII.

This new genus has some of the characteristics of *Dunatothrips* but can be distinguished by the presence of postocular setae and cheek setae, the normally developed tube, and the presence of a row of tubercles instead of a single tubercle on the fore femur. It is most closely related to *Csirothrips* described above, in which the fore femora are massive but without tubercles. The absence of duplicated cilia from the broad fore wings and the presence of praepectal plates constitute an unusual combination of characters which is discussed above under *Csirothrips*. The extension on to the tergite of the sternal glandular area of the male is apparently unique to this genus. The three species included in this genus probably all live in between *Acacia* phyllodes tied together by caterpillars. The generic name is derived from the initial letters of the Waite Agricultural Research Institute in recognition of the valuable assistance they provided for this study.

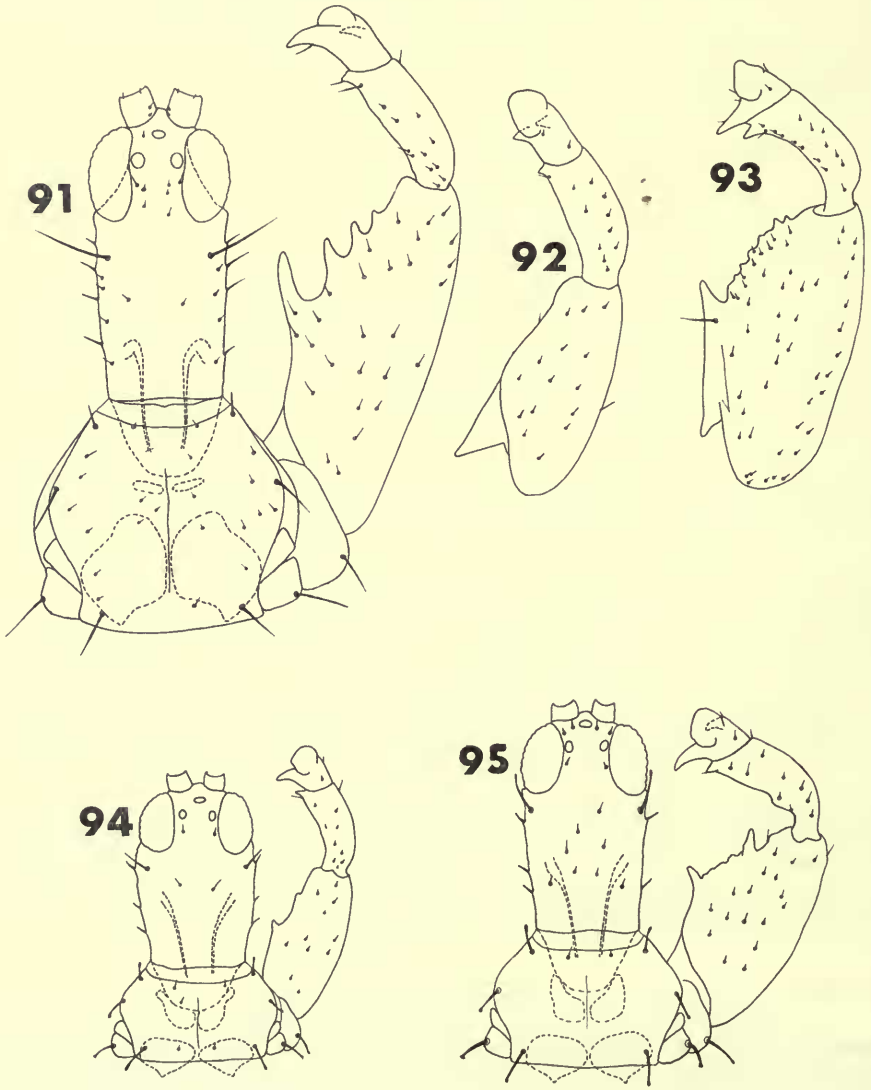
KEY TO THE SPECIES OF *WARITHRIPS*

1 Postocular seta barely reaching hind margin of eye; maxillary stylets close together in middle of head; pronotal midlateral setae absent; fore femur of ♀ with one large median tubercle and a distal row of smaller tubercles (Text-fig. 93); tergite IX of ♀ with B_3 short and thorn-like . . . . . ***distinctus*** (p. 456)

– Postocular seta much longer than the distance of its base from hind margin of eye; maxillary stylets not close together (Text-fig. 91); pronotal midlateral setae present 2

2 Fore femur of ♀ elongate, median tubercle curved, distal tubercles decreasing in size (Text-fig. 91); fore wing with sub-basal setae B_2 and B_3 normally developed; major setae on tergite IX softly rounded at apex . . . . . ***acaciae*** (p. 455)

– Fore femur of ♀ stout, with two major tubercles connected by a row of small tubercles (Text-figs 94 & 95); fore wing with an additional sub-basal seta distal and posterior to B_3; major setae on tergite IX expanded at apex . . . . . ***maelzeri*** (p. 456)



FIGS 91–95. *Warithrips* species. 91, *acaciae*, head, pronotum and fore leg of large female. 92, *acaciae*, fore leg of male. 93, *distinctus*, fore leg. 94, *maelzeri*, head, pronotum and fore leg of small female. 95, *maelzeri*, large female (praepectus and probasisternum dotted).

Warithrips acaciae (Moulton) **comb. n.**

(Text-figs 91 & 92)

Thaumatothrips acaciae Moulton, 1968 : 106–107.

The genus *Thaumatothrips* is at present restricted to the type-species *froggatti* Karny. Although *froggatti* has similar fore femora and a similar antennal sense cone formula to the species of *Warithrips*, it can be distinguished by the presence not only of fore wing duplicated cilia and all five pairs of pronotal major setae, but also by the absence of the praepectus. As Moulton has stated, *acaciae* looks rather like a species of *Euoplothrips*, a genus of leaf-rolling thrips on mesophytic trees in the Pacific area. But species of that genus are readily distinguished because their fore wings have a distinct median constriction, and there are three sense cones on the third antennal segment.

Moulton described *acaciae* from three females which were sent to him dry on cards by W. W. Froggatt. The rest of Froggatt's original series, consisting of nine females and one male, has been compared with Moulton's holotype. The male is here described and accepted as the allotype. According to Froggatt's labels, which are not easy to read, the collector was G. Withers, not Froggatt himself, and the specimens were collected in December 1926 associated with the galls of *Kladothrips augonsaxxos*. The species is probably not a primary gall-former. The figures given below indicate that the growth pattern of the head is allometric. The head is relatively much more slender in large than in small females, although the ratio between the head and tube lengths is constant.

♀ macropterous. Contrary to the original description, antennal IV has three sense cones, pronotal anteroangular setae are short, epimeral setae are not acute at apex.

Measurements (in microns) of small and large specimens. Body length 2350 (3000). Head, length 320 (420); width across eyes 190 (220); postocular seta 70 (120). Pronotal shield, length 200 (320); median width 280 (370); anteroangular seta 30; epimeral seta 50 (90). Fore wing, length 900 (1250); distal width 100. Tergite IX, B_1 70 (100); B_2 50 (65); B_3 160 (200). Tube length 200 (260). Antennal segments length III–VIII, 61 (87); 58 (80); 58 (77), 65 (77); 55 (70); 23 (25).

♂ macropterous but dealate. Colour as in female, head short and pronotum broad as in small female; metanotum lightly reticulate, median setae short; pelta reticulate, rounded laterally; fore tarsal tooth small, fore femur without tubercles (Text-fig. 92); tergite IX with B_2 short and stout as in female, with apices softly rounded; sternite VIII with transverse glandular area extending on to lateral quarters of tergite.

Measurements (in microns) of allotype. Body length 2300. Head, length 270; width across eyes 190; postocular seta 70. Pronotal shield, length 190; median width 320; epimeral seta 60. Tergite IX, B_1 120; B_2 80; B_3 160. Antennal segments length III–VIII, 58; 55; 55; 58; 58; 23; sense cone on III 8.

Material studied. Holotype ♀. New South Wales: Gilgandra, on *Acacia doratoxylon*, 1926 (*W. W. Froggatt*), in California Academy of Sciences (Moulton No. 1686), but see comments above on this data.

New South Wales: Gilgandra, 9 ♀, 1 ♂ in galls on *Acacia doratoxylon*, 29–30.xii. 1926 (*G. Withers*) in ANIC.

Warithrips distinctus (Moulton) comb. n.

(Text-fig 93)

Thaumatothrips distinctus Moulton, 1968: 104–106.

This species can be distinguished from *Thaumatothrips* by the presence of praepectal plates, and the absence of fore wing duplicated cilia and pronotal anteromarginal setae. The unique holotype is damaged and has probably been remounted from a dry card. The pronotal midlateral setae are apparently absent. The postocular setae are not as strongly expanded as the original figure indicates (40–47μ long, 3μ at apex), and the inner dorsal seta of the fore femur is acute at the apex. The cheek setae are weaker than in the other species of *Warithrips* except for the basal pair, and the species can be recognized by the armature of the fore femur and the large ventral seta (B_3) on tergite nine.

Measurements (in microns) of holotype. Body length 2500. Head, length 400; width across eyes 240. Tergite IX, B_1 110; B_2 135; B_3 50. Tube length 225.

Material studied. Holotype ♀. South Australia: Barton (*A. M. Lea*), in California Academy of Sciences (Moulton No. 3113).

Warithrips maelzeri sp. n.

(Text-figs 94–97)

♀ macropterous. Colour brown to dark brown, mid and hind tarsi yellow except at apex; fore tibiae brown or light brown; fore tarsi and basal half of antennals III–VII usually yellow-brown; fore wings clear, cilia dark; major setae pale, terminal setae of tube long and dark.

Head with cheeks narrowing to base from postocular tooth, gynaecoid specimens have rounded cheeks and no postocular tooth. Antennal VII very short, suture not strongly oblique (Text-fig. 96). Pronotal anteromarginal seta more than half as long as anteroangular in oedymerous specimens. Tubercles of fore femur and tibia reduced in gynaecoid specimens (Text-fig. 94). Tube rather stout, not strongly tapering but constricted just before apex.

Measurements (in microns) of holotype with small ♀ in parentheses. Body length 2650 (2100). Head, length 350 (290); width behind eyes 210 (195); postocular seta 80 (55). Pronotal shield, length 190 (130); median width 300 (260); epimeral seta 65 (35). Mesonotal midlateral seta 23 (16). Fore wing, length 1100 (900); distal width 110 (95); sub-basal setae 30–40. Tergite IX, B_1 145 (100); B_2 95 (80); B_3 195 (160). Tube, length 210 (175); terminal setae 310 (280). Antennal segments length, 30; 50; 65; 55; 55; 61; 68; 13.

♂ macropterous. Colour similar to female but antennae usually paler and fore tibiae darker. Head without postocular tooth, cheeks roundly narrowed to base. Fore femur without tubercles, fore tibial tubercle small. Glandular area on sternite VIII extends dorsally on to lateral quarters of tergite VIII.

Measurements (in microns) of allotype. Body length 2400. Head, length 290; median width 195; postocular seta 52. Pronotal shield, length 165; median width 300; epimeral setae 65. Fore wing, length 275; distal width 97. Tergite IX, B_1 130; B_2 80; B_3 175. Tube, length 170; terminal setae 290.

Material studied. Holotype ♀. South Australia: Mt. Lindsay, Birksgate Range, 27°01'S 129°55'E, on an *Acacia* tree, between two broad phyllodes tied together by a caterpillar, 6.viii.1962 (*D. A. Maelzer*), in ANIC.

Allotype ♂ with 20 ♀, 7 ♂ paratypes collected with the holotype, in ANIC, BMNH and Waite Institute.

This species was kindly forwarded to the author by Miss Helen Brookes of the Waite Agricultural Research Institute, Adelaide. The type-locality is in the north-west of South Australia, and the phyllodes of the host plant are reminiscent of *A. oswaldi*. Unlike gall-forming species, the larvae of *maelzeri* are brightly coloured with red hypodermal pigment.

XANIOTHRIPS gen. n.

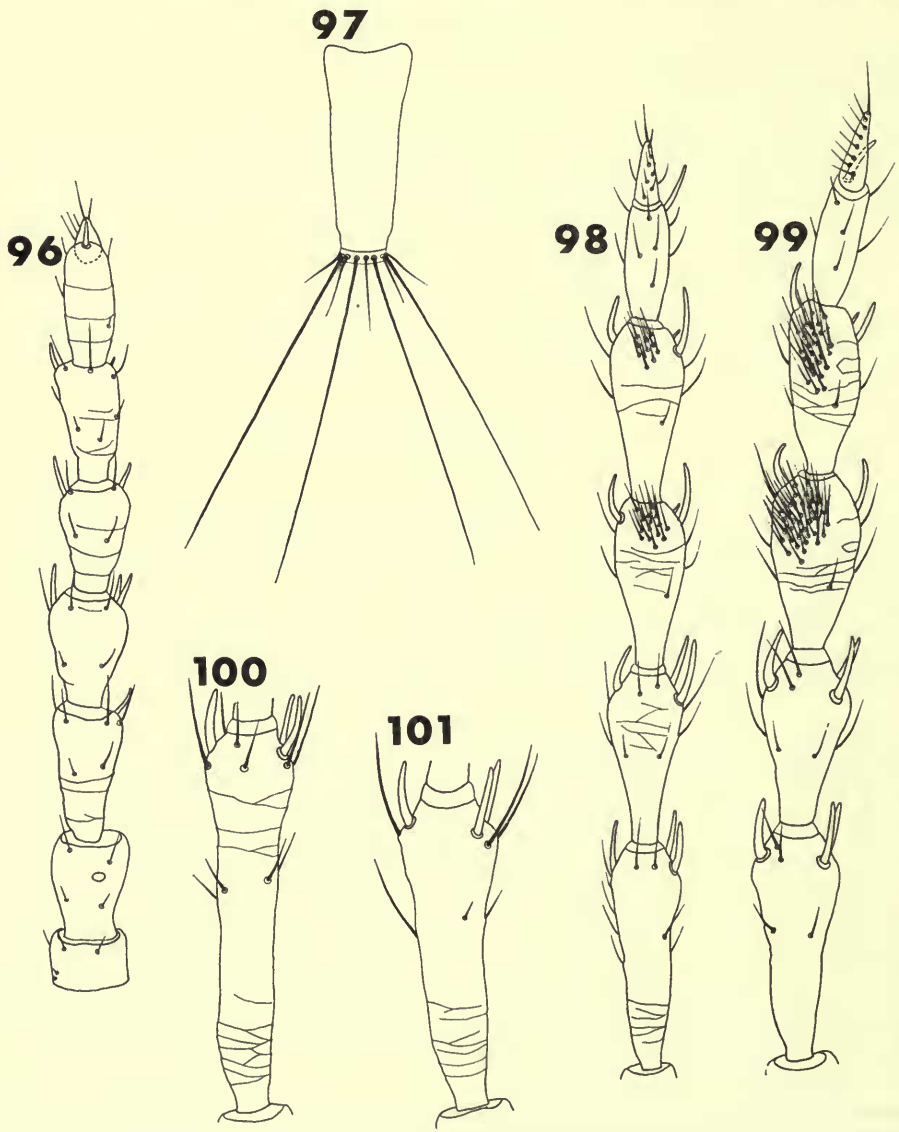
Type-species: *Xaniothrips xantes* sp. n.

Large, bicoloured, macropterous species of Phlaeothripinae. Head longer than wide, eyes bulging, cheeks narrowed to base with a stout seta near base; ocelli not directed forwards; postocular setae reaching hind margin of eye; maxillary stylets wide apart low in head, mouth cone short and rounded. Antennae eight-segmented, III and IV with three sense cones, V and VI with about 10–40 small sensory hairs ventrally; VIII less than half as long as VII, broadly joined to VII by transverse suture. Pronotal shield almost flat, epimeral sutures complete; posteroangular setae long, epimeral setae and midlaterals shorter, anteroangulars and anteromarginals frequently not developed; praepectus absent; probasisternum with transverse anterior margin; mesopraesternum broad and complete but sometimes eroded medially leaving only two lateral plates. Legs slender, fore tarsi without tooth in both sexes; hind tibiae with three stout apical spines, mid and hind femora with several stout setae on posterior margin. Mesonotal median furrow less than half as long as sclerite, midlateral setae developed. Metanotal median setae small. Fore wings very broad near duplicated cilia, apical cilia short; sub-basal setae small. Pelta wider at base than long; tergites II–V with two pairs of sigmoid wing-retaining setae, these are usually reduced on VI and VII; lateral margins of tergite II in ♀ with about six short stout setae; median tergites strongly transverse, with posterior border wider than anterior; posteroangular setae of tergite IV–VII exceptionally long, as long as median length of tergites; marginal setae of tergite IX stout at base; dorsal pair of terminal setae on tube much stouter than remaining terminal setae. Sternites II–VIII with at least six pairs of marginal setae, these form long combs in female but are less conspicuous in male; numerous accessory setae distributed across sternites; sternite VIII of male without glandular area; navicula of male genitalia with a long acute apex.

This genus is apparently unique in the Thysanoptera in the form of the terminal setae of the tube and the remarkable comb-like arrangement of the sternal marginal setae of the females. The broad wings with relatively few duplicated cilia, the maxillary stylets low in the head, and the form of the mesonotum, the metanotum and the last two antennal segments are all similarities to *Lichanothrips* described above. However, the simple slender legs and the well developed mesopraesternum suggest that *Xaniothrips* is unrelated. *Sacothrips* Moulton, 1968, has a similar long head with a pair of stout basal setae, but the fore tarsal tooth is well developed, the tube very long and the setae on tergite nine short. It is not possible at present to relate this new genus to any known form, nor to place it in a suitable tribe. The generic name is derived from the Greek word *xanion*—a carding comb, in reference to the comb-like setae of the female.

The two new species described in this new genus were collected by the author on a group of four young trees of *Acacia harpophylla*. They were living between green tied phyllodes, and as the individuals were highly active, pairs of tied phyllodes were picked from the trees and placed in a large plastic bag. At the time of collection it was assumed that only one dominant species was present, but later study

showed that there were seven species, including *Xaniothrips xantes*, *X. leukandros*, *Lichanothrips albus*, *L. pulchra* and *L. magnificus*. As a result of the collecting method it was not possible to know what species were associated with each other between any one pair of phyllodes, but the two *Xaniothrips* were the dominant species and of these *xantes* was the most abundant. There was no evidence that the



FIGS 96–101. 96–97. *Warithrips maelzeri*: 96, antenna. 97, tube and terminal setae. 98–101. *Xaniothrips* species. 98, *xantes*, male, antennal segments III–VIII (ventral view). 99, *leukandrus*, male, antennal segments III–VIII (ventral view). 100, *xantes*, female, antennal segment III. 101, *leukandrus*, female, antennal segment III.

phyllodes were tied together by Lepidopterous larvae, but instead, where two phyllodes were in contact there was a thin film of a sticky white substance. In the opinion of the author these phyllodes were stuck together by a secretion produced by a thrips species, and as the *Xaniothrips* were the most abundant it is possible that they were the originators of this complex association of species. The external surface of the phyllodes was tinged with a red colour, as also was noted on the surface of thrips-induced phyllode galls on *A. harpophylla*.

Key to the Species of *Xaniothrips*

1 Mid and hind femora yellow; hypodermal pigment of body red; males similar in colour to females but much smaller; marginal setae of sternite VIII of female arranged as in VII with a wide median interval; antennae elongate (Text-fig. 100), III more than 4·4 times as long as wide in female, more than 3·2 times as long as wide in male; antennal V with less than 20 short sensory hairs on ventral surface in both sexes (Text-fig. 98); tergite IX B_1 of female as long as B_2, longer than tube ***xantes*** (p. 459)

Mid and hind femora dark brown except at apex; body without red hypodermal pigment; males almost white, not much smaller than small females; marginal row of setae on sternite VIII of females continuous, without a median interval as on VII; antennae shorter with stouter segments (Text-fig. 101), III less than 3·8 times as long as wide in female, less than 2·8 times as long as wide in male; antennal V with more than 30 short sensory hairs on ventral surface in both sexes (Text-fig. 99); tergite IX B_1 of female shorter than B_2, shorter than tube ***leukandrus*** (p. 461)

Xaniothrips xantes sp. n.

(Text-figs 98, 100 & 102)

♀ macropterous. Body colour brown with red hypodermal pigment; legs golden yellow; antennals III–VII yellow with pale brown apices, VIII brown; dorsal pair of terminal setae on tube dark brown; sternal marginal setae reddish brown; wings shaded except near base, cilia dark.

With the characters given above in the generic definition and key to species. Head with faint transverse lines of sculpture; antennal V with 12–18 small sensory hairs on ventral surface, VI with 8–12 such hairs.

Measurements (in microns) of holotype ♀ with small ♀ in parentheses. Body length 5100 (4200). Head, length 560 (520); basal cheek seta 80 (73); postocular seta 160 (135). Pronotal shield, length 330 (290); median width 435 (385); epimeral seta 70 (70); posteroangular seta 240 (170). Mesonotal midlateral seta 40. Metanotal median seta 35. Fore wing, length 2200 (2000); distal width 450 (380); sub-basal setae 80; 90; 35 (80; 80; 30); number of duplicated cilia 18 (14). Tergite IV, posteroangular seta 520 (420). Sternite IV, longest marginal seta 290 (260). Tergite IX, B_1–B_3 450 (420). Tube, length 385 (350); dorsal terminal seta 290 (250). Antennal segments length, 95; 100; 210; 145; 145; 115; 90; 42 (80; 100; 195; 130; 130; 105; 80; 37).

♂ macropterous. Colour and structure similar to female but body size much smaller. Antennal V with 10–14 small sensory hairs on ventral surface, VI with 6–12 ventral hairs (Text-fig. 98). Sternal marginal setae numerous but short and stout. Tergite IX seta B_3 short and fine, B_2 shorter than B_1 but both stout at base.

Measurements (in microns) of allotype ♂. Body length 3150. Head, length 400; basal cheek seta 65; postocular seta 100. Pronotal shield, length 225; median width 320; epimeral seta 50; posteroangular seta 145. Fore wing, length 1500; distal width 280; number of dupli-

cated cilia 13. Tergite IV posteroangular seta 210. Sternite IV longest marginal seta 50. Tergite IX, B_1 225; B_2 145; B_3 95. Tube, length 240; dorsal terminal seta 160. Antennal segments length, 65; 75; 113; 80; 86; 80; 70; 35.

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: 50 miles south west of Dalby, in tied green phyllodes of *Acacia harpophylla*, 16.vii.1968 (*L. A. Mound* 734), in ANIC.

Allotype ♂ with 8 ♂, 40 ♀ and larvae collected in tied phyllodes on same group of trees as holotype, in ANIC and BMNH.

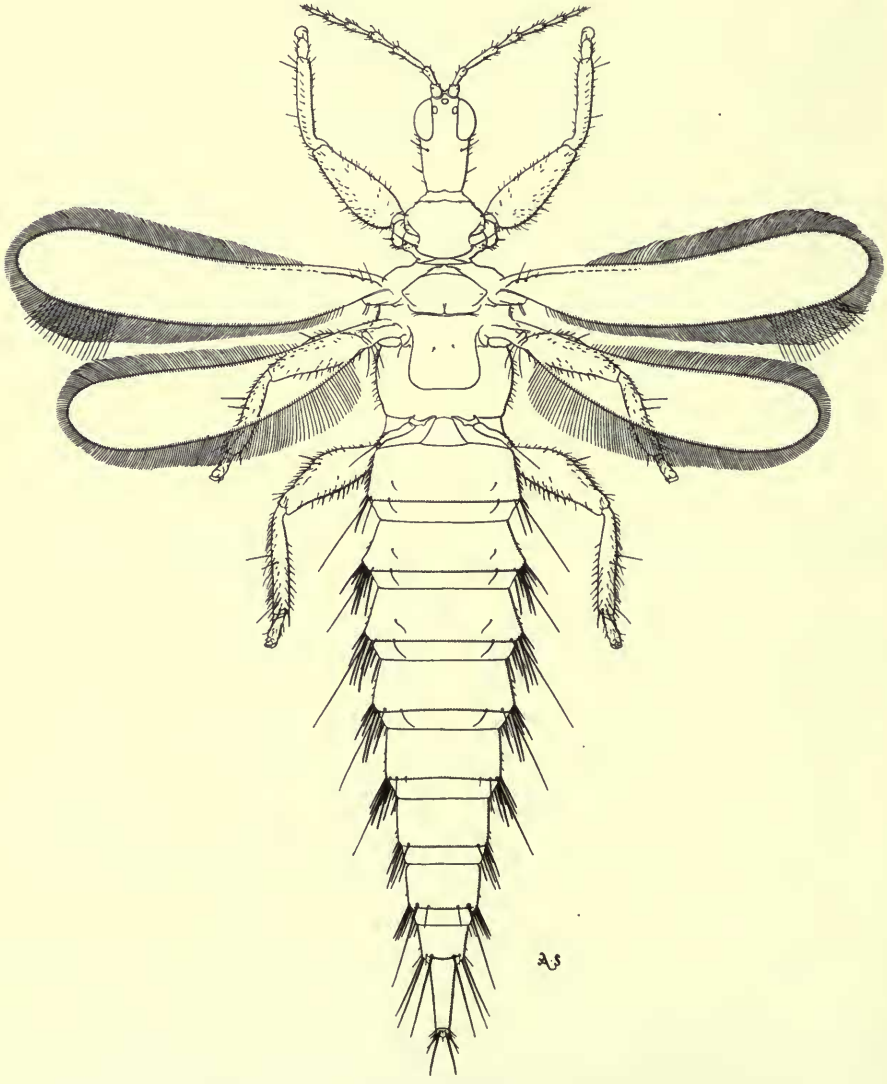


FIG. 102. *Xaniothrips xantes*, female.

Xaniothrips leukandrus sp. n.

(Text-figs 99 & 101)

♀ macropterous. Body colour brown, without red hypodermal pigment; all tibiae and tarsi golden yellow, fore femora brown at extreme base, mid and hind femora dark brown in basal two thirds; antennal segments III–VII yellow with brown apices; sternal marginal setae and stout setae on hind legs bright reddish brown, terminal setae of tube dark brown; fore wings shaded except at base, cilia dark.

Very similar to *xantes* but differing in the characters given in the key. Antennal V with 30–45 small sensory hairs on ventral surface, VI with 16–25 sensory hairs. Median marginal setae of sternite eight very close together, the stout marginal setae form a continuous transverse row.

Measurements (in microns) of holotype ♀ with small ♀ in parentheses. Body length 6000 (4700). Head, length 550 (510); basal cheek seta 70 (58); postocular seta 100 (80). Pronotal shield, length 385 (310); median width 480 (420); epimeral seta 65 (55); posteroangular seta 210 (160). Fore wing, length 2600 (2100); distal width 520 (380); number of duplicated cilia 28 (29). Tergite IV, posteroangular seta 410 (270). Sternite IV, longest marginal seta 440 (340). Tergite IX, B_1 350 (260); B_2 and B_3 520 (420). Tube, length 400 (330); dorsal terminal seta 270 (230). Antennal segments length, 90; 100; 180; 130; 145; 135; 100; 48 (80; 85; 145; 113; 125; 115; 83; 40).

♂ macropterous. Body colour mainly yellow; pale brown shading on median area of pronotum and head, also pterothorax and tube; legs clear yellow; antennals I and II yellow, II–VII yellow with apex brown, VIII brown; fore wings very weakly shaded, cilia dark; dorsal setae on tergite IX and tube brown, remaining setae pale.

Antennal segment V with 35–40 small ventral sensory hairs, VI with 20–25 ventral hairs (Text-fig. 99). Dorsal terminal setae of tube longer than tube.

Measurements (in microns) of allotype. Body length 3900. Head, length 450; postocular seta 80. Pronotal shield, length 275; median width 370. Fore wing, length 1900; distal width 300; number of duplicated cilia 18. Tergite IX, B_1 195; B_2 180; B_3 115. Tube, length 195; dorsal terminal seta 245. Antennal segments length, 70; 80; 132; 94; 100; 97; 77; 38.

MATERIAL STUDIED. Holotype ♀. QUEENSLAND: 50 miles south west of Dalby, in tied green phyllodes of *Acacia harpophylla*, 16.vii.1968 (*L. A. Mound* 734), in ANIC.

Allotype ♂ with 5 ♂, 5 ♀, collected in tied phyllodes on same group of trees as holotype.

Table II

Summary of Host Records of Phlaeothripinae from *Acacia* species

(* indicates gall-forming species)

Division ***Phyllodineae***

Section ***Juliflorae***

aneura
- Csirothrips watsoni
- Dunatothrips aneurae
- Koptothrips dyskritus
- *Oncothrips antennatus
- *Onychothrips tepperi
- *Onychothrips arotrum

brachystachia
- *Onychothrips tepperi
- *Onychothrips arotrum

doratoxylon
- *Kladothrips augonsaxxos
- Warithrips acaciae

longifolia
- Akainothrips citritarsus
- Grypothrips mantis
- Katothrips tityrus

floribunda
- Dactylothrips priscus

Section ***Plurinerves***

cambagei
- Katothrips yamma
- *Kladothrips ellobus
- Koptothrips xenus

harpophylla
- Akainothrips citritarsus
- Dactylothrips marsupium
- Dactylothrips giraulti
- Grypothrips curiosus
- *Kladothrips acaciae
- Koptothrips zelus
- Lichanothrips albus
- Lichanothrips magnificus
- Lichanothrips pulchra
- Xaniothrips xantes
- Xaniothrips leukandrus

homalophylla
- *Oncothrips tepperi

implexa
- Akainothrips citritarsus
- Grypothrips mantis
- Katothrips tityrus

melanoxylon
- Katothrips tityrus
- *Oncothrips rodwayi

oswaldi
- Katothrips hyrum
- Koptothrips flavicornis
- Koptothrips dyskritus
- *Oncothrips tepperi

pendula
- Grypothrips mantis
- Katothrips pendulae
- *Kladothrips rugosus
- Koptothrips flavicornis
- Oncothrips habrus

sclerophylla
- *Oncothrips tepperi

stenophylla
- Akainothrips citritarsus
- Grypothrips mantis

Section ***Uninerves***

retinodes
- Katothrips duplex

Division *Bipinnatae*

Section *Botrycephalae*

baileyana
Kellyia hoodianus

botrycephala
Kellyia hoodianus

decurrens
Rhopalothripoides froggatti

dealbata
Dactylothrips australis
Rhopalothripoides froggatti

elata
Kellyia hoodianus

mearnsii
Dactylothrips tasmani
Rhopalothripoides froggatti

parramattensis
Rhopalothripoides froggatti

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INDEX

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